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LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

LEAKING UNDERGROUND STORAGE TANK SITE ASSESSMENT REPORT

VOLUME II
APPENDICES

Building TC-341
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

Prepared For:

Commander
Naval Facilities Engineering Command
Atlantic Division
Norfolk, Virginia 23511-6287

Prepared By:

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April 13, 1994

Law Engineering Job No. 475-09183-01

APPENDIX A

COMPREHENSIVE SITE ASSESSMENT WORKPLAN

LEAKING UNDERGROUND STORAGE TANK
SITE ASSESSMENT WORKPLAN

HEATING PLANT BUILDING TC-341
MARINE CORPS AIR STATION
CAMP LEJEUNE, NORTH CAROLINA

Issued: December 2, 1993
Navy Contract No. 62470-93-D-4020
Law Engineering Job No. 475-09183-01

Law Engineering, Inc.
Raleigh, North Carolina

December 2, 1993

LANTNAVFACENGCOM
1510 Gilbert Street
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia 23511-6287

Attention: Trueman Seamans, Code 1821
Engineer-in-Charge

Subject: **LEAKING UNDERGROUND STORAGE TANK**
SITE ASSESSMENT WORKPLAN
HEATING PLANT BUILDING TC-341
MARINE CORP AIR STATION
CAMP LEJEUNE, NORTH CAROLINA
NAVY CONTRACT NO. N62470-93-D-4020
LAW ENGINEERING JOB NO. 475-09183-01

Dear Mr. Seamans:

Please find enclosed one copy of the above referenced Workplan document. This document covers those tasks designed to identify and delineate subsurface petroleum-related contamination and estimate its direction and rate of movement at the above referenced site. Please review the enclosed document and contact us regarding any questions or comments. Also note that we plan to begin field activities on or about January 26, 1993. Law Engineering appreciates the opportunity to continue to provide services to you and LANTDIV on your environmental projects. We look forward to hearing from you soon.

Sincerely,

LAW ENGINEERING, INC.

Brian J. Bellis, P.G.
Principal Hydrogeologist

Jeffrey B. Tyburski
Project Geologist

BJB/JBT/pjp

ENCLOSURES

cc: Kathy Molino - Contracts, correspondence only
Deborah Pickett - Environmental Management Division - Camp LeJeune
Tom Morris - Environmental Management Division - Camp LeJeune

TABLE OF CONTENTS

TABLES

DRAWINGS

APPENDICES

1.0 INTRODUCTION

1.1 Purpose and Scope of Investigation

The purpose of this Leaking Underground Storage Tank (LUST) Site Assessment Workplan (Workplan) is to serve as a guidance document and procedural manual for performing tasks to aid in determining the magnitude and extent of soil and ground-water contamination; identifying possible free product accumulation; and assessing potential exposure to possible subsurface petroleum-related contaminants in the vicinity of Heating Plant Building TC-341, also known as the former Mess Hall Heating Plant, Camp Geiger, Camp Lejeune Marine Corps Base. The release was detected after petroleum constituents were encountered in soil and ground-water samples obtained near the former location of a number 6 heating oil tank of unknown size that was reportedly installed around 1941. A 6-inch diameter below ground fuel supply line reportedly connected the tank to the adjacent Camp Geiger Fuel Farm which is located to the east of the site. The UST and associated pipeline reportedly have been abandoned in place. The location of the project site is shown in Drawing 1.1. The location of the former USTs with respect to the surrounding area is shown in Figure 2.1.

This Workplan was prepared in accordance with the Scope of Work (SOW) developed by the Naval Facilities Engineering Command and requirements listed as Tasks I through X of the document entitled "Comprehensive Site Assessments at LUST Sites: Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater" prepared by the Groundwater Section of the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR), March, 1993. The objective of the Comprehensive Site Assessment is to provide sufficient data to meet the requirements of Sections 280.63 and 280.65 of 40 CFR Part 280, Federal Technical Standards for Underground Storage Tanks and Sections .0704 and .0706 of Title 15A, Chapter 2, Subchapter 2N, North Carolina Criteria and Standards Applicable to Underground Storage Tanks.

The project will include the advancement of fourteen soil borings into which twelve Type II and two Type III monitoring wells will be installed. Samples will be collected from the soil borings (soil) and monitoring wells (ground water) as well as from the three existing Type II monitoring wells that surround the UST for both on-site and off-site laboratory analysis. The on-site laboratory results will be available within 24 to 72 hours to provide data to assist in determining the location of subsequently installed wells. At least three of the Type II monitoring wells will be located crossgradient and upgradient of the tank. The remaining Type II wells will be used to assess the

horizontal extent of the contaminant plume. One Type II monitoring well will be paired with each of the two Type III monitoring wells to evaluate the vertical extent of contamination. The first well pair will be located near the downgradient side of the UST. The second well pair will be located at the estimated leading edge of the contaminant plume. Slug tests will be conducted on three of the Type II monitoring wells to evaluate the hydraulic conductivity of the shallow aquifer system.

2.0 PREVIOUS INVESTIGATIONS, REMEDIATION AND/OR CLOSURES

A suspected release from the UST was first documented by Law Engineering, Inc. in September of 1991 during the investigation of the adjacent Camp Geiger Fuel Farm. The study identified the number 6 heating oil UST and associated piping as a potential source of contamination. One soil boring was advanced adjacent to the UST to provide a preliminary determination as to whether or not the tank had leaked. The analysis of two soil samples collected from the boring at 3 to 4.5 feet and 8.5 to 10 (at ground water) feet BGS detected total petroleum hydrocarbons (TPH) at 8,400 and 5,100 parts per million (ppm), respectively, by EPA Methods 3550 and 5030 (Law Engineering, 1991).

Based upon the findings presented by Law Engineering, Inc. a three well site check was performed at the subject site by ATEC Associates, Inc. in June of 1992. Results of this work are presented in ATEC's report dated September 24, 1993. Each of the three Type II monitoring wells were installed to a depth of 20 feet bgs with 10 feet of 0.010-inch slotted polyvinyl chloride (PVC) screen and 10 feet of PVC riser. Ground water was measured between 9 and 10 feet bgs.

Headspace analysis of soil collected from the three monitor well soil borings yielded readings ranging from 0 to 119 ppm. Analysis of three soil samples collected from the approximate depth of ground water from each of the three monitoring well borings indicated concentrations of TPH (EPA Method 8015) in each sample ranging from 110 to 2,000 ppm. Analysis of the soil samples for benzene, toluene, ethylbenzene, and xylenes (BTEX) detected total BTEX concentrations in MWS-1 and MWS-2 from 155 parts per billion (ppb) to 5,530 ppb, respectively (ATEC, 1992).

Ground-water samples were collected from each of the three monitoring wells and were also analyzed for BTEX. Analytical results indicated total BTEX concentrations of 34 ppb in MW-2. BTEX was not detected in ground-water samples collected from MW-1 and MW-3 (ATEC, 1992).

Ground-water was measured to flow to the east. The rate of groundwater flow in the surficial aquifer was calculated by assuming a porosity of 30 percent, a measured water table gradient of 0.005 ft/ft, and an assumed hydraulic conductivity of 0.28 ft/day for a fine sand aquifer. Based upon this information, a ground-water flow velocity of 0.005 ft per day was calculated (ATEC, 1992).

3.0 SITE DESCRIPTION

The site description involves the collection of information regarding the history and physical characteristics of the site to identify and evaluate known and/or potential source(s) of contamination and conditions that will assist in determining, in part, sample locations. Potential contaminant migration pathways that may influence subsurface contaminant migration characteristics and limit intrusive subsurface investigation will also be identified. These typically include the presence of surface or near surface features, such as asphalt pavement, surface water impoundments, and buried utility lines or storm drains.

3.1 Area of Investigation

The site is located east of D Street between Third Street and Fourth Streets. The UST included in this study is located approximately 90 feet west of building TC-341 and 20 feet east of D Street. The exact location of the UST is not clearly marked or identified on base drawings but can reportedly be identified as a slight cresting of the ground surface. The topography in the vicinity of the site is relatively flat and is at an elevation of approximately 15 feet above mean sea level (msl). Most of the area is not serviced by storm sewers. Runoff generally travels by sheet flow before entering drainage ditches which discharge into Brinson Creek which is located approximately 1000 feet northeast of the site.

3.2 Site History and Operation

The abandoned UST was used to supply number 6 heating oil to a heating plant which has since been demolished. The UST was reportedly installed around 1941. An underground fuel distribution supply line connected the UST to the Camp Geiger Fuel Farm.

3.3 Contaminant Source Inventory

At this time, no determination has been made as to whether the leak occurred from the heating oil UST and/or the associated fuel line. Several building structures were once located east of the site which have since been demolished and include an ice house and a gasoline filling station. The Camp Geiger Fuel Farm also is located east of the site. Suspected or known areas of soil and ground-water contamination have been documented for these sites, all of which are located downgradient of the study area with respect to shallow ground-water flow direction.

3.4 Water Well Inventory/Water Supply

Six water supply wells are located within a 1/2-mile radius of the site and are generally located to the northwest. Five of the six wells are located on the perimeter of the 1/2-mile radius and one is located approximately 800 feet north of the site. All of the wells reportedly are installed in the Castle Hayne Formation.

3.5 Utility Survey

Underground utilities within the project area include underground sewer, water, and electric lines. A water line runs parallel to the east side of D Street. The sewer line generally runs along the north side of fourth street. The abandoned 6-inch underground fuel line to the UST is also expected to still be intact. Underground utilities will be located with the assistance of base personnel prior to drilling.

4.0 SITE CHARACTERIZATION

The Site Characterization involves the collection of information to characterize the physical setting of the project area. Information regarding the geology/hydrogeology, topography, and other physical characteristics of the site and vicinity will be evaluated to identify conditions that could potentially affect the migration of petroleum contaminants. The information available at this time has revealed the following:

4.1 Regional Geology/Hydrogeology

In the Camp Lejeune area, sediments deposited in marine or near-marine environments are about 1,500 feet thick and overlie igneous and metamorphic basement rocks. The aquifers of the Camp Lejeune area are the surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. They are separated by less

permeable clay and silt beds (confining units) that serve to impede the flow of ground water between the aquifers (Harned, 1989).

The surficial aquifer is a series of sediments, primarily sand and clay, which commonly extend to depths of 50 to 100 feet. This unit is not used for water supply on the Base. The principal water supply aquifer for the Base is the series of sand and limestone beds that occur between 50 and 300 feet below land surface. This series of sediments generally is known as the Castle Hayne aquifer. The Castle Hayne aquifer is about 150 to 350 feet thick in the area and is the most productive aquifer in North Carolina. It is a critical water-supply source, not only for Camp Lejeune but also for the southern coast and east-central Coastal Plain of North Carolina (Harned, 1989).

Camp Lejeune/Camp Geiger is situated in an area where the Castle Hayne aquifer contains fresh water, although the proximity of saltwater in deeper layers just below the aquifer and in the New River estuary is of concern in managing water withdrawals from the aquifer. The aquifers that lie below the Castle Hayne consist of a thick sequence of sand and clay. Although some of these aquifers are used for water supply elsewhere in the Coastal Plain, they contain saltwater in the Camp Lejeune area (Harned, 1989).

Water levels in wells tapping the surficial aquifer vary seasonally. The surficial aquifer receives more recharge in the winter than in the summer when much of the water evaporates or is transpired by plants before it can reach the water table. Therefore, the water table generally is highest in the winter months and lowest in summer or early fall. The hydraulic head in a confined aquifer, such as the Castle Hayne, shows a different pattern of variation over time than that in an unconfined aquifer. Some seasonal variation also is common in the water levels of the Castle Hayne aquifer, but the changes tend to be slower and over a smaller range than for water-table wells (Harned, 1989).

4.2 Site Geology/Hydrogeology and Soils

Soils encountered in each of the ATEC monitor well locations reportedly consist of a surficial brown to gray silty sand to 4 feet bgs which is underlain by a brown to gray medium sand to 10 feet bgs. Greenish gray fine to medium sands were encountered from 13 to 15 feet bgs, followed by greenish gray to gray medium sands from 18 to 20 feet bgs.

4.3 Site Topography and Other Surface Characteristics

The project area is at an elevation of approximately 15 feet above mean sea level (USGS 1971). The project area is relatively flat. Much of the site consists of open grassed areas. The location of the UST reportedly can be identified by a slight crest of the ground.

5.0 POTENTIAL RECEPTORS

The information collected in sections 2.0, 3.0, and 4.0 will be evaluated to provide a preliminary listing of potential receptors that could be affected by the known/suspected release of petroleum. Potential receptors of contamination, as defined by the North Carolina Division of Environmental Management, include surface water bodies, ground water supply wells, and subsurface building structures.

One water supply well is mapped within 1,000 feet of the site and is located approximately 800 feet to the north. Based upon the local groundwater flow direction, which is generally to the east to northeast, it appears unlikely for the well to be effected by a release from the UST being investigated in this study.

Brinson Creek is located approximately 1000 feet northeast of the site. Local groundwater flow and surfacewater drainage generally flows toward Brinson Creek. It is expected that wetlands are associated with this surface water body.

6.0 SUBSURFACE METHODOLOGY INVESTIGATION

The major objectives of the subsurface investigation are to (1) define the approximate lateral and vertical extent of free product accumulation (if any) and dissolved-phase ground-water contamination resulting from possible discharge of petroleum fuels at the site; and (2) determine the approximate direction and rate of migration of ground-water contaminant constituents at the project site including the identification of preferential pathways of contaminant migration. To accomplish this, fourteen soil borings will be advanced to install twelve Type II, three Type III monitoring wells. Field activities will be performed in adherence to procedures and guidelines contained in the project Health and Safety Plan (Appendix A). The specific methods to accomplish these objectives are outlined below:

6.1. Soil Test Borings

Fourteen soil test borings will be advanced on the site by a truck-mounted drill rig to install twelve Type II and two Type III monitoring wells. Hollow-stem augers will be used to advance the soil borings utilizing split spoons for soil sample collection at five-foot intervals as described in Section 7.2.

The on-site geologist/engineer will examine the soils from the borings to obtain lithological data to define near-surface geologic conditions and continuously monitor soils for evidence of contamination using visual and olfactory methods, and field screening using head-space analysis as described in Section 7.1. Special emphasis will be placed on visual evaluation of soils by field personnel for evidence of contamination since the presence of heavier hydrocarbons characteristically cannot be entirely detected by a photoionization detector (PID) or flame ionization detector (FID) using the field headspace methods.

The soil borings for the Type II monitoring wells will be advanced to a terminal depth of approximately five feet below the shallow ground-water table. The soil borings for the Type III wells will be installed to a maximum depth of 50 feet BGS. If a confining unit is encountered within 50 feet BGS, a soil sample will be collected from the confining unit for grain size distribution analysis and the boring will be terminated at the surface of the confining unit. Boring depths and well configurations may be modified slightly based on actual hydrogeological characteristics. The final locations of the borings will be subject to subsurface utility clearance.

6.2 Monitoring Well Design, Installation, and Development

A total of twelve Type II (shallow) wells and two Type III (deep) monitoring wells will be installed during the project. The information will be used to obtain data necessary to:

1) further define the lithology beneath the project site;
2) develop a water-table contour map and determine the direction of ground-water flow across the project site;
3) ascertain the lateral extent and approximate thickness of the free product plume, if present;
4) establish the approximate geometric dimensions (vertical and lateral) of the dissolved-phase contaminant plume(s), if present; and
5) provide for reproducible sampling points in the upper and lower portions of the surficial aquifer.

The assigned well identification numbers for this site are as follows:

TC-341MW-4 through TC-341MW-15

6.2.1 Monitoring Well Locations

The locations of the monitoring wells are based upon the results of previous subsurface investigations, geologic and hydrologic information, site topography, and visual assessment of the site. At least one Type II well will be located upgradient and two cross-gradient of the suspected/known source of contamination. The remaining Type II wells will be located at downgradient positions to delineate the horizontal extent of contamination. The Type III wells will be paired with selected Type II wells and will be aligned along the downgradient axis of the suspected plume to ascertain vertical components of flow gradient and assess the vertical extent of contamination with respect to distance from the source. When the first three monitoring wells have been installed in the vicinity of the UST, Law field personnel will conduct a preliminary survey of the newly installed and existing wells to provide an updated calculation of the approximate direction of shallow groundwater flow. The results will compared against those presented in previous reports and assessed to determine if the locations of the wells shown in Drawing 2.1 are appropriate. We anticipate that wells will be located within the study area shaded on Drawing 2.1.

6.2.2 Monitoring Well Design and Construction

The monitoring wells will be constructed of 2-inch diameter PVC, machine slotted well screens and 2-inch diameter, Schedule 40 PVC riser pipe, except in traffic areas, where Schedule 80 PVC riser pipe will be utilized. Piping will be flush jointed and threaded, and wells will be constructed without the use of glue. Sand packs will be constructed of washed silica Torpedo sand (ASTM C190).

The well drilling will be performed by a truck-mounted rig fully equipped for dry auger drilling. All wells will be installed by a qualified driller registered in the State of North Carolina and well installation will be supervised in the field by an experienced staff or project level geologist or engineer specializing in subsurface investigation. No grease or oil will be used on drill pipe joints. However, Teflon tape, vegetable oil, or phosphate-free laboratory detergent such as Liquinox will be used for lubrication, if required.

6.2.3 Detailed Monitoring Well Installation Procedures

The PVC screen and riser pipe used in well construction will be pre-cleaned and packaged by the manufacturer. All well casing and screens will be transported and stored at the site in original packaging. Personnel handling these items will not handle tools or drilling equipment while installing the well. Clean, new disposable latex rubber gloves will be worn when handling well screens or casing. Personnel who are handling the drilling equipment will not be allowed to handle the well screens or casing until a new "clean" pair of gloves are worn.

The Type II monitoring wells will be installed as follows:

- Boreholes will typically be advanced with 4.25-inch I.D. hollow stem auger to a maximum depth of 25 feet BGS or less to intersect the shallow water table, collect soil samples, and install the well. The final depth of the monitor well soil boring will be determined by installing approximately half of the length of the well screen below the water table. A total of ten feet of well screen is desired; however, fifteen foot sections of well screen may be used if necessary. The length of well screen utilized must be consistent throughout the project. The final depth of the monitoring wells should take into account seasonal variations in the depth to groundwater.

- If "heaving or running" sands are encountered, a 2.5-inch I.D. auger may initially be advanced to collect split spoon soil samples followed by the 4.25-inch I.D. hollow stem auger with a bottom plug.

- Soil samples for chemical analysis will be collected via split spoon sampling in accordance with procedures outlined in Sections 4.1.1 and 4.3 of this Workplan.

- At one well location that is representative of the surficial aquifer, one soil sample will be collected in the saturated zone and analyzed for grain size distribution to obtain additional information regarding the hydraulic and physical properties of the aquifer material.

- The desired sections of 2-inch well screen and riser pipe will be assembled and lowered to the bottom of the augers.

- The lengths of all screen and riser casing sections and bottom plugs will be measured and recorded.

- Washed silica filter sand will be poured into the augers to construct a continuous filter pack within the augers which will extend from approximately one foot below the bottom of the well screen to a maximum of two feet above the slotted section. The depth to the sand pack will be frequently measured through the augers using a decontaminated weight attached to a fiberglass measuring tape while removing the augers from the boring without rotating them to maintain the sand inside the augers as the filter pack is constructed.

- A 2-foot-thick bentonite seal will be emplaced above the sand filter pack by pouring bentonite pellets through the augers in the manner described above if necessary or will be installed directly into the annular space. Distilled water will be added to the annular space at ten-minute intervals to aid in the hydration of the bentonite seal. The bentonite seal will be allowed to hydrate in accordance with manufacturer's recommendations.

- The annular space above the bentonite seal will be tremie grouted from the bottom to within approximately 3 feet of land surface with neat cement grout.

- After allowing the grout to set, the concrete pad and well head cover will be installed to complete the installation.

- In non-traffic areas, each well head will be protected with three Schedule 40, protective steel pipes, 3-inch I.D., imbedded in a minimum of 2.5-feet of 3,000 psi concrete. A security pipe with a hinged locking cap, having an embedment depth of 2.5 feet into the concrete, will be installed over the well casing. The security pipes will extend 3.0 feet above the ground surface and will be filled with concrete and painted day-glow yellow or an equivalent. A concrete apron constructed of 3,000 psi concrete and measuring 5-foot by 5-foot by 0.5 foot will be constructed around each well located in non-traffic areas (Drawing 6.2.3-A). All wells will be secured with a No. 4 brass Master Lock padlock.

- In traffic areas, a flush manhole cover will be built into a three foot square, concrete collar, which will be 9 inches thick. If the well is installed through a paved or concrete surface, the annular space between the casing and the borehole will be grouted to a depth of at least 2.5 feet and finished with a concrete collar. If the well is not installed through a paved or concrete surface, then a concrete apron, measuring 5 foot by 5 foot by 0.5 foot will be constructed around each well. The collar and pad will be constructed of 3,000 psi concrete and will be crowned to meet the finished grade of surrounding pavement as required. All wells will be secured with a No. 4 brass Master padlock (Drawing 6.2.3-B).

- Final well construction details will be provided on the forms included as Drawing 6.2.3.

The Type III monitoring wells will be installed in two phases, as follows:

- The Type III wells will be constructed in two stages and will be paired with a Type II monitoring well. The borehole for the first stage will be advanced with 8.25-inch I.D. (12.25-inch O.D.) hollow stem auger drilling technique to a depth of approximately 40 feet BGS or to approximately ten feet above the first confining layer below the water table, which ever is encountered first.

- A sample of the confining unit will be collected and analyzed for grain-size distribution.

- An appropriate number of schedule 40, 6-inch diameter PVC pipe sections will be assembled and lowered to the bottom of the augers to complete the first stage of the Type III monitoring well.

- The 6-inch pipe will be grouted into place and allowed to set for a period of 24 to 48 hours prior to installation of the second stage of the well so that the structural integrity of the grout will not be compromised.

- Utilizing the roller cone drilling techniques, a 5 7/8-inch diameter hole will be drilled through the bottom of the 6-inch outer casing to a terminal depth of 10 feet below the 6-inch casing (on top of the confining unit) or to a maximum depth of 50 feet BGS if no confining unit is encountered.

- A five foot length of 2-inch diameter PVC screen will be installed at the bottom of the boring with 2-inch diameter PVC riser pipe to the surface.

- The lengths of all screen and riser pipe sections and bottom plugs will be measured and recorded.

- Washed silica filter sand will be poured into the boring to construct a continuous filter pack within the augers which will extend from below the bottom of the well screen to a maximum of two feet above the slotted section. The depth to the sand pack will be frequently measured using a decontaminated weight attached to a fiberglass measuring tape.

- A 2-foot-thick bentonite seal will be emplaced above the sand filter pack by pouring bentonite pellets into the borehole in the manner described above.

- The annular space above the bentonite seal will be tremie grouted from bottom to within approximately 3 feet of land surface with neat cement grout.

- After allowing the grout to set, the concrete pad and well head cover will be installed to complete the installation. The well head will be completed in accordance with the specifications for the Type II wells.

- A vertical separation of at least 15 feet should exist between the bottom of the adjacent Type II well and the top of the screened portion of the Type III well.

6.2.4 Monitoring Well Development

Well development will be performed no sooner than 24 hours after grouting is completed for Type II wells or 48 hours for Type III well. Wells will be developed by continuous low yield pumping or bailing and the pumps will be set near the bottom of each well. As the wells are developed, ground-water turbidity will be monitored as an indicator parameter and be noted visually and recorded. Well development will continue until the turbidity stabilizes. Monitoring Well Development Worksheets, as shown in Drawing 6.2.4, will be used to record the results of the field analyses. Water generated during the well development activities will be handled according the procedures specified in Section 6.3.

6.2.5 Ground-Water Level and Free Product Thickness Measurement

Prior to well purging for sample collection, water level and free product thickness, measurements will be obtained in all monitoring wells at the site no sooner than 48 hours after completion of well development activities. Measurements will be obtained in all monitoring wells at the site on the same day to provide a complete set of comparable measurements. These measurements will be used to calculate hydraulic gradients, determine direction of ground-water flow at the site, and estimate thickness of free product (if present) in the subsurface beneath the site.

Water level and free product thickness measurements will be obtained using an electronic interface probe. The liquid levels will be measured by slowly lowering the interface probe into the well. When the probe reaches the water or free product surface, the circuit is completed and a buzzer is activated. A constant buzzing indicates the presence of free product while an intermittent buzzing indicates water. The distance from the surveyed marker on the top of the well casing to either the water or free product level is then read off the measuring tape attached to the probe and recorded. If free product is present, the thickness will be measured to the nearest 0.01 foot. Depth to water will also be measured to the nearest 0.01 foot. The interface probe will be decontaminated between wells by detergent wash and distilled water rinse. A complete set of water level measurements taken on the same day will be recorded on the Water Elevation Worksheet (Drawing 6.4).

6.3 Disposal of Borehole Cuttings and Wastewater

Borehole cuttings will be containerized in a roll-off box at or near the project site. The roll-off box will be covered with plastic or tarp at the end of each work day to prevent infiltration of rainwater and release of windblown particles. Ultimate disposal of the material at a permitted facility will be based on analytical results and/or regulatory consultation to ascertain whether the waste material is designated hazardous or non-hazardous. Development and purge water will be containerized and removed from the site for disposal of an off-site permitted facility. All soil and ground-water will be placed in DOT-approved containers and properly labeled prior to any shipment. Manifests will be prepared for all waste shipped from the site.

6.4 Surveying

Horizontal and vertical locations of site wellheads will be surveyed in reference to mean sea level. Surveys will be supervised by a registered land surveyor.

7.0 SAMPLE COLLECTION METHODOLOGY

The following sections describe the methods that will be utilized to collect soil and groundwater samples for this project. All samples will be collected by OSHA-certified personnel who are trained and experienced in sample collection procedures.

7.1 Test Boring Soil Sample Collection and Field Screening Methodology

Field screening will be conducted during drilling of the test borings to determine if petroleum hydrocarbons are present in the unsaturated zone and to identify areas of suspected near-surface releases. Soil samples for general site characterization will be obtained from the test borings at five-foot intervals (or shorter intervals under shallow groundwater conditions) starting at 0 to 1.5 feet. The soil samples will be obtained using a split spoon sampler driven in general accordance with ASTM D-1586. Soil samples will be classified in the field by an engineer or geologist trained in using visual/manual techniques as described in ASTM D-2487 and D-2488. The soils will be classified in accordance with the Unified Soils Classification System and a test boring record of each borehole will be produced. A sample test boring record used for final presentation of test boring data is shown as Drawing 6.1.

Two soil samples will be obtained from the vadose zone in each boring for field screening and laboratory analysis. The first laboratory sample will be obtained from 2 to 5 feet BGS. The second soil sample will be collected near the water table to 5 feet above the water table. For Type III wells, the second soil sample will be collected from the first few feet of the confining unit (if encountered). If a confining unit is not encountered, no sample will be collected from the saturated zone.

For each collected soil sample, two equal portions will be removed from the splitspoon sampler. One portion will be placed into appropriate pre-labeled laboratory sample jars with the other portion placed into a pre-labeled, airtight, plastic bag. Soil collected in the laboratory jars will be immediately placed on ice. The air tight plastic bag of soil will either be placed in direct sunlight (if above 70 degrees Fahrenheit) or on the hood or dashboard of a vehicle (with the engine/heater running) to sufficiently heat the sample in order to volatilize any petroleum product contained within the soil. After several minutes, the vapors contained in the void area within the bags (headspace) will be tested with a PID or an FID. The headspace method involves placing a consistent amount of a representative soil sample in a zip lock plastic bag. After a several minute waiting period to allow volatile organic compounds to vaporize within the bag headspace, a portable PID or FID is used to test for the presence of volatile organics that are within the detection limits of the instrument.

For each site, approximately the first 50% of the soil samples collected by the method described above will sent to the on-site laboratory and the remainder will be sent to the off-site laboratory. Soil samples that are selected for on-site laboratory analysis will be handled and analyzed in accordance with procedures outlined in Section 7.5.2 of this Workplan. No change in screening or on-site laboratory instrumentation will occur during the site investigation in order to enhance consistency of results, unless the instrumentation is damaged and needs replacement.

Analysis for TCLP metals, flash point and pH will be performed on selected soil samples which exhibit obvious signs of contamination or high headspace readings. These samples will be obtained during the soil boring process.

All soil samples collected for laboratory analyses will be placed on ice. Soil will be placed into containers in the following order in accordance with the type of analyses scheduled for that sample:

Collection Order	Bottle Size and Type	Total Number of Bottles per Sample, On-site/Off-Site Labs	Preservative
TPH 5030	Glass Septae Jar, 4 oz.	2/2	<4°C
TPH 3550	Amber Glass Wide Mouth/ 8 oz.	1/2	<4°C
TPH SW846/9071	Amber Glass Wide Mouth/8 oz.	1/1	<4°C
TCLP Metals	Amber Glass Wide Mouth/8 oz.	NA/1	<4°C
Flash Point	Amber Glass Wide Mouth/8 oz.	NA/1	<4°C
pH	Glass or Plastic Wide Mouth/8 oz.	NA/1	<4°C

NA = Not Applicable. Analysis not scheduled for on-site laboratory.

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

7.2 Monitoring Well Ground-water Sample Collection

The ground-water sampling program has been developed to aid in the assessment of the magnitude and extent of free product accumulation and dissolved-phase ground-water contamination that may be present as a result of petroleum fuel releases at the project site. The sampling program will consist of collecting one ground-water sample from each of the newly constructed wells and the three existing monitoring wells that were recently installed by ATEC. After all monitoring wells have been installed and developed, purging and sampling of the three existing and newly installed wells will proceed from the least contaminated areas to the highest contaminated areas based on observations made during the well installations, measurement of free phase product, and distance from the known source of contamination. The sampling program will include collection of samples for both on and off-site laboratory analysis; field analysis of pH, specific conductance, and temperature; static ground-water level measurements; and product thickness measurements.

The Law Engineering Monitoring Well Sampling and Field Data Worksheet (Drawing 7.3) will be used to record all measurements made during well purging and sampling activities. This form was designed to be used as a checklist and to provide documentation for all ground-water sampling activities for each individual well.

Each well will be purged prior to sample collection to remove potentially stagnant water from the well in an effort to collect samples that are representative of the surrounding aquifer. A volume of water equivalent to at least three times the amount of water standing in the well will be removed from the well during the purging process, or the well will be bailed to dryness. Specific conductance, pH, and water temperature will be measured periodically during well purging. Wells that can be purged to dryness while purging less than three well volumes will be sampled as soon as the well has recovered to yield sufficient water volume for a sample. All purge water removed from the wells will be disposed of in accordance with procedures for disposal of development water as described in Section 6.3 of this Workplan.

Well purging will be conducted using decontaminated, clear Teflon bailers. New nylon rope will be used at each monitoring well location. Care will be taken to prevent contact between the rope and the ground during well purging and sample collection. Purging techniques will be performed in accordance with standard practices followed by comparable professionals working in the petroleum contamination assessment field. The volume of water to be purged is calculated using the following equation:

$$V = \pi r^2 h$$

where:

π = *3.14159*

r = *Radius of well casing*

h = *Height of water column in well (total well depth - depth to ground water prior to purging)*

V = *Volume of water in well (standing well volume)*

Minimum purge volume = $V \times 3$

Samples will be collected within 24 hours of the completion of the purging process. The following sample handling procedures will apply to all ground-water samples:

- Chemical preservatives, if applicable, will be added to sample bottles by the laboratory.
- Sample bottles will be labeled prior to sample collection.
- Sample bottles will be filled directly from the Teflon bailer.
- The pH, temperature, and specific conductance of the sample will be measured and recorded. These measurements will be taken from a sample decanted into a separate container. Visual characteristics of the sample, including the presence of insoluble materials, will be recorded on field sampling forms.
- Caps will be secured on bottles.
- Volatile organic sample containers will be placed in plastic bags and the bags sealed.

All monitoring well ground-water samples collected for laboratory analyses will be placed immediately on ice. Ground-water will be collected and placed into containers in the following order based upon the type of laboratory analyses scheduled for that sample:

Collection Order	Bottle Size and Type	Total Number of Bottles per Sample On-Site/Off-Site Lab	Preservative
602	Clear Glass Vial/40 ml	2/3	HCL
610	Amber Glass/1 Liter Jar	1/2	<4°C
8 RCRA Metals	Plastic/1000 ml	NA/1	Nitric Acid

NA = Not Applicable. Analysis not scheduled for on-site Laboratory.

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

7.3 Sample Identification

Prior to collecting each soil and groundwater sample, associated sample bottles will be labeled with the following information:

- Date and time of sample collection;
- Project identification number;
- Sample location number;
- Initials of person who collected sample;
- Type of preservative added to sample; and
- Parameter(s) or parameter group to be analyzed.

Additional specific information, such as sampling interval, may be added. The sample location number on the label will correspond to the sample location numbers assigned on the field site map.

7.4 Chain of Custody and Transportation Procedures

Chain of Custody (COC) procedures will be followed to establish documentation to trace sample possession from the time of collection until completion of analysis for both the on-site and off-site laboratories. In order to accomplish this objective, as few people as possible will handle the sample(s) and the sampler will be responsible for the care and custody of the samples until they are delivered to the on-site laboratory or dispatched for shipment to the off-site laboratory. An accurate record of sample collection, transport and analysis will be maintained and documented.

The COC Record will be used by personnel responsible for ensuring the integrity of samples from the time of collection to shipment to both the on and off-site laboratories. The laboratory will not proceed with sample analysis without a correctly prepared COC Record and an Analytical Request Form. The laboratory will be responsible for maintaining COC of the sample(s) from the time of receipt to disposal. COC procedures will be instituted and followed throughout the investigation.

The COC Record will be signed by each individual who has maintained custody of the sample(s). General preparation of the COC Record for samples to be delivered to the on-site and off-site laboratories will be as follows:

- Samples will be accompanied by a COC at all times.
- The COC Record will be initiated in the field by the person collecting the sample(s). Every sample will be assigned a unique identification number as described in Section 7.4 that is entered on the COC Record. The date and time of sample collection will also be recorded on the COC Record.
- The COC Record will be completed in the field and will identify the project, sampling team, LAW assigned project number, and other pertinent project information.
- If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for "Relinquished By _____" will be signed by the sampler.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the Record as "Relinquished By _____."

7.4.1 Off-Site Laboratory

Collected soil and ground-water samples will be transported on a daily basis by courier to Law's Analytical Laboratory in Pensacola Florida. Prior to the start of the field investigation, necessary arrangements will be made with the laboratory to assure proper and prompt delivery and log in of the collected samples. Shipment and COC procedures are as follows:

- Samples will be packed properly for shipment so that bottles will not dislodge and/or break. The samples will be kept cool using either ice packs or zip-lock bags full of ice.

- Samples will be shipped each day via an overnight delivery service and the air bill number will be recorded to facilitate tracking of the package.

- The waybill will serve as an extension of the COC Record between the final field custodian and receipt in the laboratory.

- The COC record will be sealed in a watertight container and placed in the shipping container. The shipping container will be sealed with packing tape prior to being given to the carrier.

- The shipping container will be marked "fragile" to notify all handlers that special care should be taken in handling the samples.

7.4.2 On-Site Laboratory

An on-site mobile laboratory will provide analytical data at accelerated turnaround times to assist in determining the placement of sample locations. The mobile laboratory will be set up at a location central to other projects concurrently being conducted in the area. Relocation of the laboratory will avoided once it is set up since moving the laboratory would involve a recalibration of instrumentation which will delay the project schedule. Base personnel will pre-approve the proposed location of the mobile laboratory. Shipment and COC procedures are as follows:

- The samples will be packed properly for transport so that bottles will not dislodge/and or break. The samples will be kept cool using either ice packs or zip-lock bags full of ice.

- Once the samples are properly packed, the container will be adequately secured for transport to the laboratory.

- The COC Record will be maintained as described in Section 7.5.

Each Site Manager will be responsible for coordinating sample drop off and analysis schedules with on-site laboratory personnel. Responsibilities will include, but are not limited to, providing notice of the number and type of samples (soil and water) and corresponding analyses for each work week and coordinating on-site laboratory

activities with other Site Managers in order to develop a comprehensive schedule for base activities.

7.5 Equipment Decontamination

A decontamination area will be located in an area central to other investigations concurrently being conducted in the area. All decontamination water will be discharged into an oil/water separator. The water supply at the decontamination area will be sampled prior to the start of work and analyzed for volatiles (EPA Methods 602) and PAHs (EPA Method 610).

7.5.1 Drill Rig

The drill rig will be cleaned and handled in accordance with the following guidelines:

- Drill rigs and all support equipment will be cleaned of excess grease, oils and caked-on soil prior to arrival at the site. Equipment which leaks fuel, coolant, or lubricants will not be used on site.

- Equipment such as pumps and pump lines will be flushed thoroughly with potable water prior to use.

7.5.2 Soil and Ground-water Sample Collection Equipment

Teflon bailers used for ground-water sampling will be routinely decontaminated and stored after each sampling event as follows:

- Washed with phosphate-free detergent and tap water using a brush to remove any particulate matter or surface film.

- Hot tap-water rinse (if available) or distilled or deionized water rinse.

- Rinsed thoroughly with a 10% nitric acid mixture.

- Rinsed thoroughly with distilled or deionized water.

- Rinsed with isopropanol.

- Rinsed thoroughly with distilled or deionized water.

- Allowed to air dry.
- Wrapped completely with aluminum foil and sealed in airtight plastic bags.

Split spoons, submersible well development pump equipment, and other sample collection equipment will be decontaminated between sample events as follows:

- Tap water rinse.
- Washed with phosphate-free detergent and tap water using a brush to remove any particulate matter or surface film.
- Tap water rinse.
- Rinsed thoroughly with distilled or deionized water.
- Rinsed with isopropanol.*
- Allowed to air dry or rinse with distilled or deionized water.*
- Wrapped completely with aluminum foil and sealed in airtight plastic bags or placed on clean plastic if planned for immediate reuse.

* These items may be excluded in the decontamination process for split spoons.

Hollow stem augers, rods, and other downhole equipment will be decontaminated between borings as follows:

- High temperature and pressure water rinse
- If noticeable petroleum hydrocarbon film is present, wash with phosphate-free detergent and tap water using a brush.
- High temperature and pressure tap water rinse.
- Allowed to air dry.
- Placed and covered with clean plastic until next use.

7.5.3 Rinsate Sample Collection Methodology

Water rinsate samples will be collected for QA/QC purposes. Water from the same brand or batch of distilled or deionized water that is used in the decontamination process outlined above will be used to pour over previously decontaminated split spoons, Teflon bailers, and Hydropunch penetrometers. The rinsate water will be directly collected into the sample bottles. The number of rinsate samples to be collected and corresponding analytical parameters are listed in Section 8.0. The analytical results will be used to confirm that equipment decontamination is being conducted adequately and that no cross contamination is occurring between sample locations. If the rinsate samples reveal the presence of contamination, a sample of the source rinsate water will be collected and analyzed for the same laboratory parameters.

7.5.4 Duplicate Sample Collection Methodology

Soil and water duplicate samples will be collected for QA/QC purposes. The duplicate sample will consist of two soil or water samples of equal volume that are collected from the same sample location/depth. Each sample will be analyzed for the same parameters as outlined in Section 8.0. At least one of the duplicate samples will be split between the off-site and on-site laboratories to compare each lab's analytical report with the other. The remaining duplicate samples will be either sent to the on-site laboratory and/or to the off-site laboratory to assess the lab's ability to reproduce analytical results.

8.0 SAMPLE ANALYSIS

The majority of the samples collected during the investigation will be analyzed by the on-site mobile laboratory. The analytical methods for this project are outlined below and in the referenced tables for both the on-site and off-site laboratories.

8.1 Off-Site Laboratory

Samples will be analyzed at Law's Pensacola, Florida and Kennesaw, Georgia analytical laboratories. Analytical methods for soils include TPH (EPA Methods 3550, 5030 and SW 846/9071), TCLP Metals, pH (EPA Method 9045), and flash point. Ground-water samples will be analyzed for purgeable aromatics (EPA Method 602) and the eight RCRA metals. Grain size analyses will be conducted by Law's soils

laboratory in Raleigh, North Carolina. The number and type of samples to be analyzed and the types of analyses to be conducted are summarized in Table 8.1.1.

8.2 On-Site Laboratory

Soil samples submitted to the on-site laboratory will be analyzed for TPH (EPA Method 5030/3550). Ground-water samples will be analyzed for purgeable aromatics (EPA Method EPA 602), and polynuclear aromatic hydrocarbons (EPA Method 610). The number and type of samples to be analyzed and the types of analysis to be conducted are summarized in Table 8.2.1.

9.0 COLLECTION AND ANALYSIS OF AQUIFER CHARACTERISTICS DATA

9.1 Slug Tests

Subsequent to development of the shallow monitoring wells, an attempt will be made to conduct three standard slug tests at three shallow Type II wells which do not contain free product. To date, our experience has been that the shallow aquifer at the base recovers too quickly allow for accurate measurement of ground-water recovery in a shallow well. If this is the case at the project site, then we will rely on grain size analysis result and published data to assess the aquifer characteristics at the site.

Slug tests will be conducted by lowering a solid "slug" into the well and allowing the water level to stabilize back to static conditions. The slug will then be quickly removed from the well and the rate of water level recovery back to the static level will be measured and recorded. This rate will be used to calculate an estimate of the hydraulic conductivity of the aquifer immediately surrounding the well screen using the method of Hvorslev (1951). The hydraulic conductivity (k) will be calculated as follows:

$$k = \frac{r^2 \ln (L/R)}{2LT_o}$$

where:
- r = well radius (ft)
- L = saturated sandpack length (ft)
- R = borehole radius (ft)
- T_o = Time required for the recovering water level to be within 37 percent of the static water level with respect to the total drawdown created.

10.0 EVALUATION OF ASSESSMENT DATA

An evaluation of the data generated during the assessment will be performed to establish and map the spatial boundaries of contaminant plume(s) and concentration gradients throughout the area. Accomplishment of this objective will aid in; (1) identifying contaminant source areas, migration pathways and potential receptors; and; if necessary, (2) establishing a basis for corrective action plans.

The initial step in the evaluation process involves data reduction. Analytical results will be reviewed and plotted by sample location on site map. The following data will be presented in tabular form:

- Sampling point identification number (or quality control designation).
- Sampling date.
- Practical quantitation limit.
- Reported concentration.
- Reported approximate concentration, if below practical quantitation limit.

A quantitative ranking of constituent concentration/sampling point combinations will be performed to identify likely source areas, delineate the approximate boundaries of the contamination plume, and establish concentration gradients of detected contaminants within the plume. Based on these results, horizontal and vertical limits of the plume area(s) and contaminant isopleth contours will be plotted on site maps and cross-sections.

11.0 ESTIMATION OF THE RATE OF CONSTITUENT MIGRATION

Ground-water travel time or average linear ground-water flow velocity will serve as the basis for estimating the rate of contaminant migration at the facility. Ground-water flow rates should represent the maximum rate of contaminant migration with variations among contaminants due to geohydrochemical processes including molecular diffusion, mechanical mixing, sorption-desorption, ion-exchange, hydrolysis and biodegradation. However, due to the difficulties associated with estimating the effects of many of these processes on contaminant migration rates and the desire to produce relatively conservative (higher) estimates, only sorption processes will be incorporated into rate calculations.

Ground-water flow velocities will be calculated using the following modification of Darcy's Law:

$$V = K/n_e(dh/dl)$$

where: K = *Hydraulic conductivity (ft/day)*
n_e = *Effective porosity (unitless)*
dh/dl = *Hydraulic gradient (ft/ft)*

Initial estimates of hydraulic conductivity will be determined from results of grain size distribution analyses of soil samples and slug tests. Estimates of hydraulic conductivity will be refined based on pumping test data as discussed in Section 9.0. Estimates of effective porosity for soils of similar grain size distribution to those at the site will be obtained from the literature. Hydraulic gradients will be calculated from water level measurements obtained as described in Section 6.2.5.

Distribution coefficients for metals will be obtained directly from published literature, whereas, distribution coefficients for organic chemicals will be calculated from octanol water partitioning coefficients and estimates of organic carbon content of the aquifer media. Octanol-water partitioning coefficients for organic constituents will be obtained directly from published literature. Estimates of bulk density and porosity will be determined from results of visual/manual classification of soils and standard penetration resistance tests as described in Section 6.1.2. Average velocities of contaminant constituents will then be calculated in accordance with the following equation (USEPA, 1985):

$$v_c = v/R$$

where: v_c = *Average velocity of contaminant constituent (ft/day)*
v = *Average linear groundwater flow velocity (ft/day)*
R = *Retardation factor (unitless)*

12.0 PROJECT SCHEDULE

A schedule for implementation of the Comprehensive Site Assessment Workplan, along with appropriate milestones, is exhibited in Drawing 12.1. One drill rig and Site Manager will be dedicated to the site throughout all of its phases of investigation.

The site investigation will be scheduled concurrently with other sites on the base. Development, purging, sampling and testing of the wells will occur after all of the wells have been installed.

13.0 REFERENCES

ATEC Associates, Inc. Underground Storage Tank (UST) Site Check, Former Mess hall Heating Plant UST, Marine Corps Base, camp Geiger, North Carolina, September 24, 1992.

Federal Register Vol. 49, No. 209, 40 CFR Part 136, Test Procedures for the Analysis of Pollutants Under the Clean Water Act, October 26, 1984.

Groundwater Section, North Carolina Department of Environment, Health and Natural Resources, Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater, March, 1993.

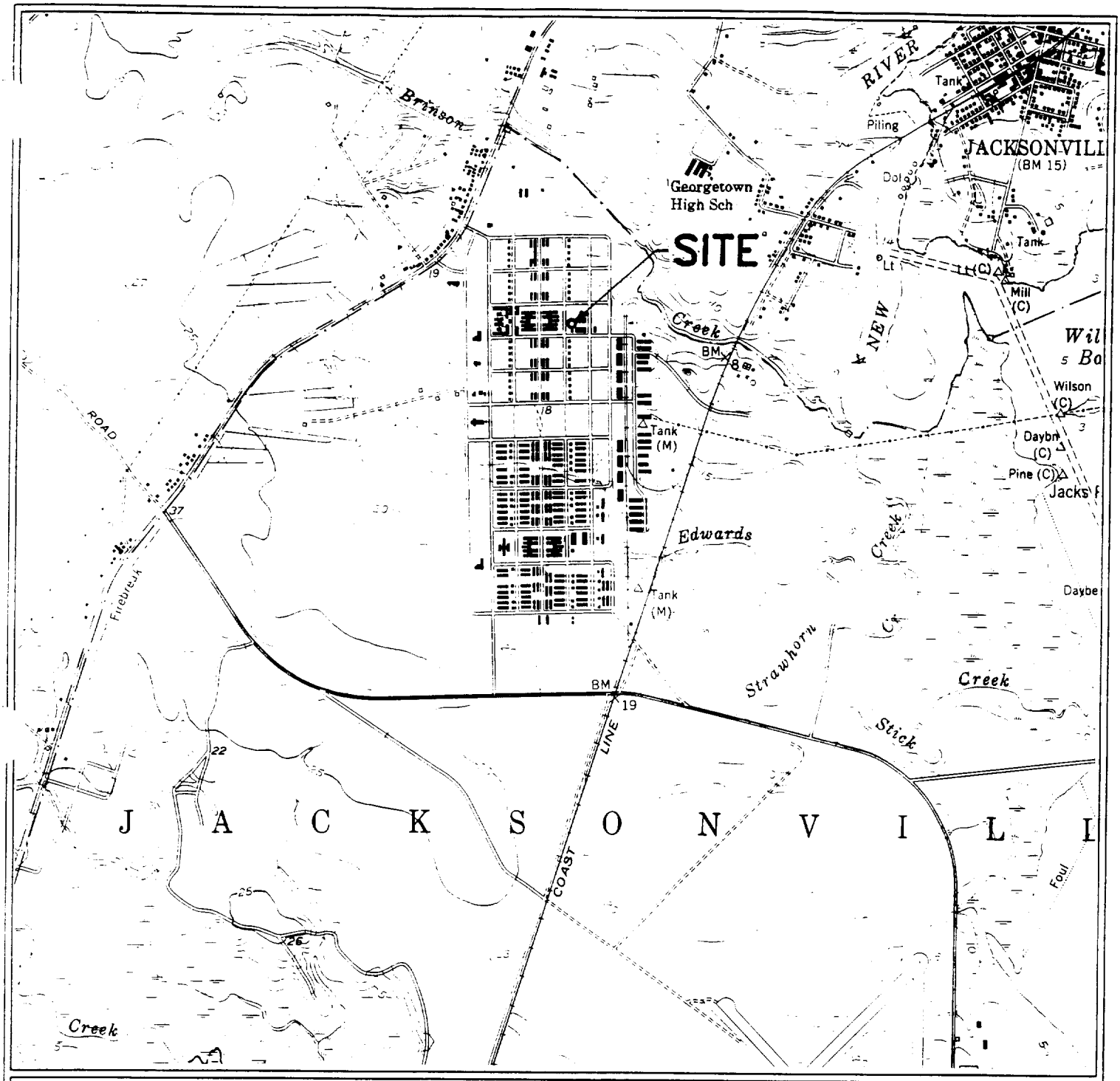
Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Groundwater Observations. U.S. Army of Engineers Waterways Experiment Station Bulletin 36, Vicksburg, Miss.

United States Environmental Protection Agency (USEPA), 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water - Parts I & II, Environmental Research Laboratory, Office of Research and Development, Athens, Georgia.

United States Environmental Protection Agency, 1986. Test Methods for Evaluating Solid Wastes (SW-846), 3rd Edition, Vol. II, Office of Solid Waste, Washington, DC.

Water and Air Research, Inc. Initial Assessment Study of Marine Corps Air Station, Cherry Point, North Carolina, March 1983.

DRAWINGS



NORTH

JACKSONVILLE SOUTH, N.C.
NW/4 NEW RIVER 15' QUADRANGLE
N3437.5–W7722.5/7.5
1952
PHOTOINSPECTED 1971
AMS 5553 III NW–SERIES V 842

CONTOUR INTERVAL 5 FEET

GRAPHIC SCALE FEET
2000 1000 0 2000 4000

QUADRANGLE LOCATION

NOTE: SITE LOCATIONS ARE APPROXIMATE.

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

TOPOGRAPHIC SITE MAP
UNDERGROUND FUEL INVESTIGATION
HEATING PLANT TC–341
CAMP LEJEUNE, NORTH CAROLINA

DRAWN: WBJ	DATE: NOV. 1993
DFT CHECK: MCM	SCALE: 1:24000
ENG CHECK: BJB	JOB: 475–09183–01
APPROVAL: JT	DWG: 1.1

THIS DRAWING IS ONLY INTENDED TO SHOW THE APPROXIMATE LOCATION OF SUBSURFACE UTILITIES. THE ACTUAL LOCATION MAY DIFFER FROM THIS DRAWING. ALL UTILITIES WILL BE MARKED AND CLEARED BY BASE PERSONNEL PRIOR TO INITIATING DRILLING OPERATIONS.

NORTH

SECOND STREET
D STREET
E STREET
F STREET
THIRD STREET
FOURTH STREET
G STREET
STUDY AREA
FORMER MESS HALL UST
PONDED WATER
BRINSON CREEK
RAILROAD
BUILDING NO TC-480
BUILDING NO TC-364
BUILDING NO TC 474
FUEL TANKS
TC-341
TC-342
SITE OF FORMER GASOLINE STATION
SITE OF FORMER ICE HOUSE
GEOPHYSICAL ANOMALY
3-25KVA
B-5 150KVA-3
MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-8 MW-9 MW-10 MW-11 MW-12 MW-13 MW-14 MW-15 MW-16 MW-17 MW-18 MW-19 MW-20 MW-21 MW-22 MW-23 MW-24 MW-25 MW-26 MW-27 PW-28
EMW-1
SB-1 SB-2 SB-3
HA-1 HA-2 HA-3 HA-4 HA-5 HA-6 HA-7 HA-8
B-1 B-36

LEGEND

- LOCATION OF PROPOSED TYPE II MONITORING WELL
- LOCATION OF PROPOSED TYPE III MONITORING WELL
- ●MW-1 LOCATION OF LAW ENGINEERING MONITORING WELL
- ▲SB-1 LOCATION OF LAW ENGINEERING STRATIGRAPHIC BORING
- ⊕B-1 LOCATION OF LAW ENGINEERING SOIL BORING
- ▲HA-1 LOCATION OF LAW ENGINEERING HAND-AUGER BORING
- ■MW-3 LOCATION OF ATEC WELL
- EMW-1■ LOCATION OF PRE-EXISTING MONITORING WELL
- 6-INCH UNDERGROUND FUEL LINE
- DIRECTION OF SHALLOW GROUNDWATER FLOW
- FENCE
- 6" POTABLE WATER MAIN WITH CORRESPONDING SIZE
- GATE VALVE
- FIRE HYDRANT
- 18" WASTEWATER LINES WITH CORRESPONDING LINE SIZE
- MANHOLE
- ELECTRICAL LINES
- TRANSFORMERS

01987E16Z

J01837D1

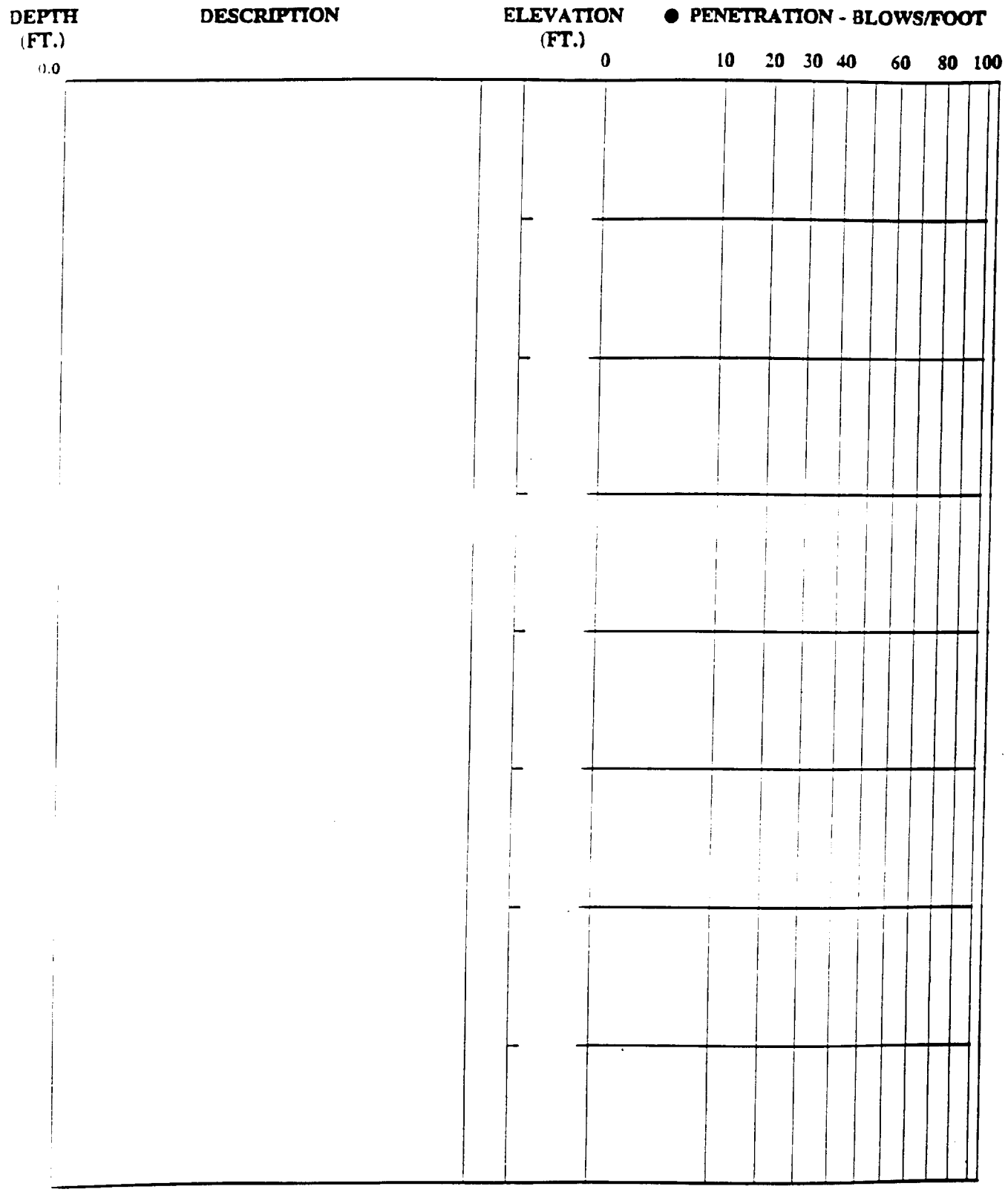
LAW ENGINEERING
RALEIGH, NORTH CAROLINA

PROPOSED MONITORING WELL LOCATIONS
HEATING PLANT TC-341
CAMP LEJEUNE, NORTH CAROLINA

DRAWN: WBJ	DATE: NOV. 1993
DFT CHECK. MCM	SCALE 1"=150'
ENG CHECK. BJB	JOB 475-09183-01
APPROVAL. J.T	DWG. 2.1

REFERENCE: JAMES E STEWART AND ASSOC.; SHT 1&2 OF 2; 9/13/91: USGS JACKSONVILLE SOUTH, N.C

DRAWING 6.1



REMARKS:

TEST BORING RECORD

BORING NUMBER
DATE DRILLED
PROJECT NUMBER
PROJECT
PAGE 1 OF 1

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

DRAWING 6.2.2

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO. _____ SERIAL NO. _____
Lat. _____ Long. _____ RO ___
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: _____

DRILLER REGISTRATION NUMBER: _____

STATE WELL CONSTRUCTION PERMIT NUMBER: _____

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: _____ County: _____

   _____
   (Road, Community, or Subdivision and Lot No.)

2. OWNER _____
   ADDRESS _____
   (Street or Route No.)

   _____
   City or Town State Zip Code

3. DATE DRILLED _____ USE OF WELL _____
4. TOTAL DEPTH _____
5. CUTTINGS COLLECTED YES ☐ NO ☐
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☐
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS _____ FT. Above Land Surface*

* **Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118**

9. YIELD (gpm): _____ METHOD OF TEST _____
10. WATER ZONES (depth): _____
    _____
11. CHLORINATION: Type _____ Amount _____
12. CASING:

	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From	To Ft.			
From	To Ft.			
From	To Ft.			

13. GROUT:

	Depth	Material	Method
From	To Ft.		
From	To Ft.		

14. SCREEN:

	Depth	Diameter	Slot Size	Material
From	To Ft	in.	in.	
From	To Ft.	in.	in.	
From	To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth	Size	Material
From	To Ft.		
From	To Ft.		

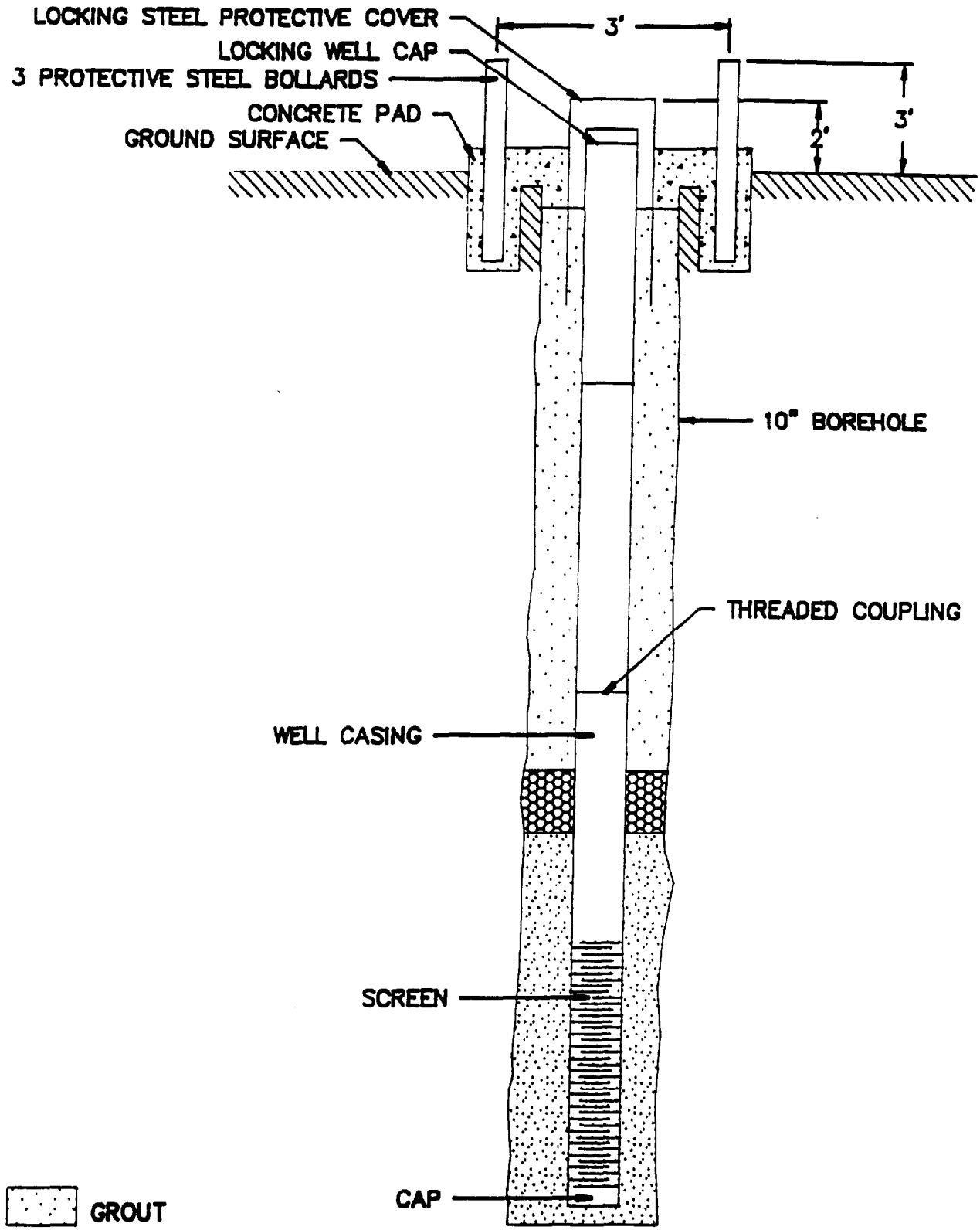
16. REMARKS: _____

DEPTH From	DEPTH To	DRILLING LOG Formation Description

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

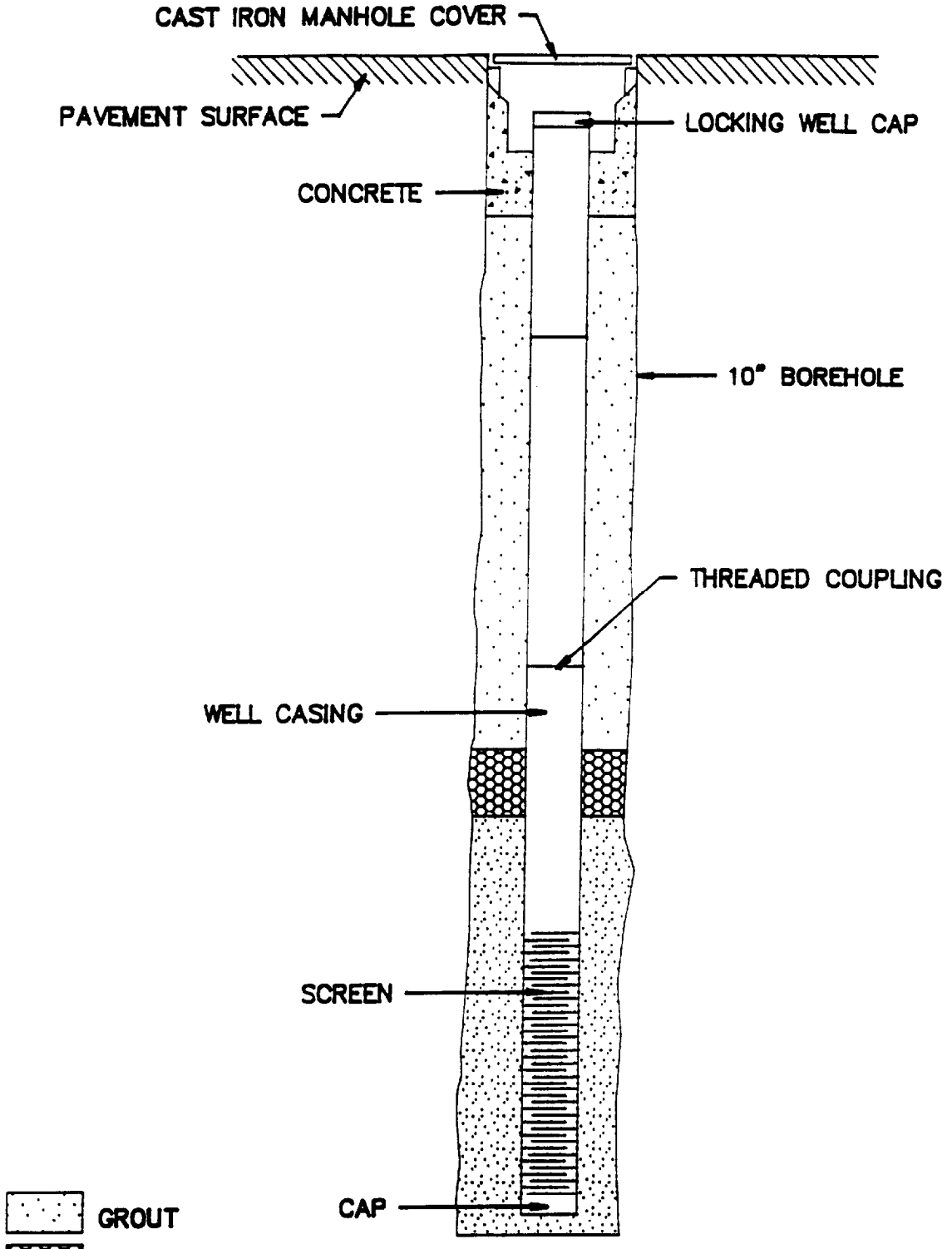


6-2-3A

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

TYPE II MONITORING WELL SCHEMATIC

DRAWN: A. Thomas	DATE: NOVEMBER 1993
DFT CHECK:	SCALE: NOT TO SCALE
ENG CHECK:	JOB NO. 475-[illegible]
APPROVAL:	DWG NO. 6.2.3-A



6-2-3B

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

TYPE II MONITORING WELL SCHEMATIC

DRAWN:	DATE: NOVEMBER 1993
DFT CHECK:	SCALE: NOT TO SCALE
ENG CHECK:	JOB NO. 475– ..
APPROVAL:	DWG NO. 6.2.3–B

DRAWING 6.2.4

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL DEVELOPMENT WORKSHEET

LAW JOB NUMBER _____ MONITORING WELL NUMBER _____

SITE NAME _____

DATE (MO/DAY/YR) _____ TIME (MILITARY) _____

FIELD PERSONNEL _____

WEATHER CONDITIONS _____

TOTAL WELL DEPTH (TWD) _____ 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE _____ 1/10 FT.

DESCRIPTION OF MEASURING POINT _____

DEPTH TO GROUNDWATER (DGW) _____ 1/100 FT. (DEPTH BELOW MEASURING POINT)

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER: _____

TOTAL VOLUME OF WATER REMOVED _____ 1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC _____ S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) _____ (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES____ NO_____	COMMENTS _____
LOCKING CAP	YES____ NO_____	_____
PROTECTIVE POST/ABUTMENT	YES____ NO_____	_____
NONPOTABLE LABEL	YES____ NO_____	_____
ID PLATE	YES____ NO_____	_____
WELL INTEGRITY SATISFACTORY	YES____ NO_____	_____

WELL YIELD LOW_____ MODERATE_____ HIGH_____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAWING 6.4

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

ENVIRONMENTAL DEPARTMENT

MONITORING WELL CASING AND WATER ELEVATION WORKSHEET

PROJECT NAME _____ JOB NUMBER _____

LOCATION _____ DATE _____

DESCRIPTION OF SURVEY DATUM _____

FIELD PERSONNEL _____

MEASURING DEVICE(S) _____

WELL NUMBER	MEASURING POINT CALCULATIONS			DEPTH TO WATER (FT)	ELEV OF WATER (FT)	PRODUCT THICKNESS (FT)	COMMENTS (ODOR, WELL COND., PROTECTIVE COVER CONDITION)
	ROD HEIGHT (FT)	INSTRUMENT HEIGHT (FT)	ELEV OF MEASURING POINT (1) (FT)				

(1) Measuring point top of casing unless otherwise noted.
ND = None detected: equipment capable of measuring ≥0.01 feet.

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEET

LAW JOB NUMBER_____ MONITORING WELL NUMBER_____

SITE NAME _____

DATE (MO/DAY/YR)_____ TIME (MILITARY)_____

FIELD PERSONNEL _____

WEATHER CONDITIONS _____

TOTAL WELL DEPTH (TWD) _____1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE _____1/10 FT.

DESCRIPTION OF MEASURING POINT _____

DEPTH TO GROUNDWATER (DGW) _____1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = _____1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X_____1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = _____1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER _____ OTHER:_____

TOTAL VOLUME OF WATER REMOVED _____1/10 GAL. CASING DIAMETER _____ In.

CASING MATERIAL PVC_____ S.S._____ TEFLON_____ OTHER_____

SCREENED INTERVAL (FROM ID PLATE) _____ (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES____ NO_____ COMMENTS_____

LOCKING CAP YES____ NO_____ _____

PROTECTIVE POST/ABUTMENT YES____ NO_____ _____

NONPOTABLE LABEL YES____ NO_____ _____

ID PLATE YES____ NO_____ _____

WELL INTEGRITY SATISFACTORY YES____ NO_____ _____

WELL YIELD LOW_____ MODERATE_____ HIGH_____ COMMENTS_____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAWING 7.2

HEADSPACE ANALYSIS RESULTS

SITE/JOB NAME _____ DATE _____

SAMPLER NAME _____ TEMPERATURE _____

JOB NUMBER _____ SUNNY _____ CLOUDY _____

SAMPLE I.D.	SAMPLE DEPTH	SOIL TYPE/DESCRIPTION	BACKGROUND READING (PPM)	SAMPLE READING (PPM)	ACTUAL * READING (PPM)

PID or FID Model _____

Electron Volts of Lamp _____

Type of Calibration Gas _____

CALIBRATION(S)			
Date			
Time			

4933

LAW ENVIRONMENTAL, INC.
NATIONAL LABORATORIES
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUSTODY RECORD

DRAWING 7.5.1

SAMPLING INFORMATION
NPDES NUMBER

NAME OF FACILITY: _____

STREET ADDRESS: _____

OJECT NAME | JOB NO.

MPLERS (SIGNATURE)

MPLING DATE

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	CONTAINER TYPE: 40 ml G VOA HCl	1 L G - AMBER	8 oz. G, W/M	2 oz. G, W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L, PL (HNO_3)	1 L, PL (H_2SO_4)	1 L, PL (NaOH+Ascorbic Acid)	1 L, PL (Zn Acetate + NaOH)	1 L PL	4 oz. PL W/M	250 ml PL	1 L TEFLON	LENL LAB NO.

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY LABORATORY: (SIGNATURE)	DATE / TIME

TRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY.
PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

MARKS _____

_____

*SOURCE CODES

RECOVERY WELL - RW
RCRA MONITORING WELL - MW
NPDES DISCHARGE - ND
DRINKING WATER - DW

DRAWING 7.5.1

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: _____ Attn: _____

From: _____ _____
(Branch/Company Name) (Dept or Name)

COC Number: _____

Project Name: _____ Project Number: _____

Date Shipped: _____ Date results requested: _____

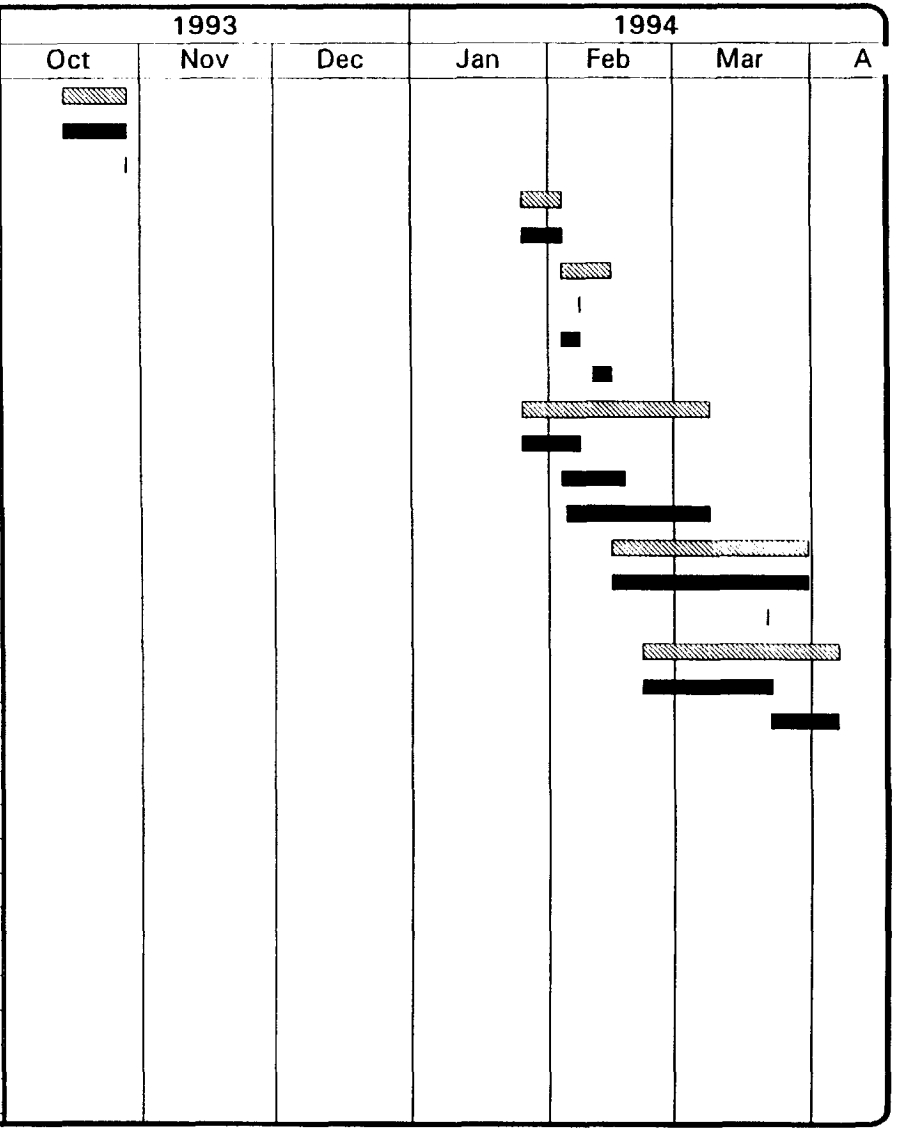
Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method

Comments:

FIGURE 12.1 PROJECT SCHEDULE

BUILDING TC-341

Task Name	Start	End
TASK 1	Oct/15/93	Oct/29/93
Work Plan / H&S Plan Prep.	Oct/15/93	Oct/29/93
Work Plan Due	Oct/29/93	Oct/29/93
TASK 2	Jan/26/94	Feb/04/94
Soil Sampling/Well Installation	Jan/26/94	Feb/04/94
TASK 3	Feb/04/94	Feb/15/94
Surveying	Feb/08/94	Feb/08/94
Well Development	Feb/04/94	Feb/08/94
Well Sampling	Feb/11/94	Feb/15/94
TASK 4	Jan/26/94	Mar/09/94
On-Site Lab Analysis	Jan/26/94	Feb/08/94
Off-Site Lab Analysis-soil	Feb/04/94	Feb/18/94
Off-Site Lab Analysis-water	Feb/05/94	Mar/09/94
TASK 5	Feb/15/94	Mar/31/94
Data Analysis/Draft Report	Feb/15/94	Mar/31/94
Draft Report Due	Mar/22/94	Mar/22/94
TASK 6	Feb/22/94	Apr/07/94
Navy Review Period (projected)	Feb/22/94	Mar/23/94
Final Report	Mar/23/94	Apr/07/94



TABLES

TABLE 8.1.1
SAMPLE ANALYSIS SUMMARY TABLE
OFF-SITE LABORATORY

HEATING PALNT BUILDING TC-341

SAMPLE COLLECTION METHOD	NUMBER OF SAMPLE LOCATIONS	TOTAL ANALYSIS QUANTITY															
		SOIL										WATER					
		TPH 3550/ 5030	TPH 3550	TPH 5030	TPH 9071/ 8021	TPH 9071	TOTAL LEAD	TCLP METALS	FLASH POINT	PH	GRAIN SIZE	502.2	601	602	610	8 RCRA METALS	TOTAL LEAD (H^2O)
Existing Wells	3	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--
Type II Wells/ Borings	12	12	--	--	--	8	--	2	8	8	1	--	--	--	4	2	--
Type III Wells/ Borings	2	2	--	--	--	2	--	--	2	2	1	--	--	--	--	--	--
6-Inch Well/ Borings	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trip Blank	1	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
Duplicate	1	1	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Rinsate	0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Number of Analyses		15	0	0	0	10	0	2	10	10	2	0	0	0	8	2	0

* Included with 3550/5030 analysis

TABLE 8.2.1
SAMPLE ANALYSIS SUMMARY TABLE HEATING PLANT BUILDING TC-341
ON-SITE LABORATORY

SAMPLE COLLECTION METHOD	NUMBER OF SAMPLE LOCATIONS	SAMPLE QUANTITY FOR ON-SITE LAB		TOTAL ANALYSIS QUANTITY							
				SOIL					WATER		
		SOIL	WATER	TPH 3550/ 5030	TPH 3550	TPH 5030	9071/ 8021	TPH 9071	601	602	610
Soil Test Borings	0	0	0	--	--	--	--	--	--	--	--
Hydropunch Penetrometers	0	0	0	--	--	--	--	--	--	--	--
Existing Wells	3	0	0	--	--	--	--	--	--	--	--
Type II Wells/ Boring	12	12	8	12	--	--	--	--	--	3	8
Type III Wells/ Boring	2	2	2	2	--	--	--	--	--	2	2
6-Inch Well/ Boring	0	0	0	--	--	--	--	--	--	--	--
Duplicate	1	1	--	1	--	--	--	--	--	--	--
Rinsate	1	--	1	--	--	--	--	--	--	1	1

APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
SOIL AND GROUND WATER ASSESSMENT ACTIVITIES

HEATING PLANT BUILDING TC-341
MARINE CORPS AIR STATION
CAMP LEJEUNE, NORTH CAROLINA

Issued: December 2, 1993
Navy Contract No. 62470-93-D-4020
Law Engineering Job No. 475-09183-01

Law Engineering, Inc.
Raleigh, North Carolina

HEALTH AND SAFETY PLAN
SOIL AND GROUND WATER ASSESSMENT ACTIVITIES

PROJECT:	LJSA, Heating Plant Building TC-341
LOCATION OF SITE:	Camp Lejeune Marine Corps Air Station
LAW JOB NO.	475-09183-01
CLIENT:	United States Navy - Atlantic Division

REVIEW AND APPROVAL

Principal Engineer W. Douglass Dixon, P.E. ____

Project Manager Brian J. Bellis, P.G. ____

DATE OF PLAN PREPARATION

December 2, 1993

DATES OF PLANNED FIELD ACTIVITIES

January 22, 1994 through February 28, 1994

SAFETY MEETING CONDUCTED: (LOCATION)_____(DATE):_____

EMERGENCY PHONE NUMBERS

Hospital: Building No. NH100
Off-site hospital route is shown on attached Drawing 1.

	ON BASE	OFF BASE
Hospital:	**451-4551**	**577-2243**
EMS:	**911**	**346-6760**
Fire:	**911**	**455-8080**
Police:	**451-4555**	**455-1472**
Operator:	**451-1113**	**0**
Information:	**451-1115**	**411**

Principal Project Professional:	W. Douglass Dixon, P.E.	(919) 876-0416
Health and Safety Officer:	Hope Williams	(919) 876-0416
Law Engineering Contact:	Brian J. Bellis, P.G.	(919) 876-0416
Activity Contact:	Tom Morris	(919) 451-5063

Location for on-site emergency gathering will be determined during Site Safety Meeting.

DESCRIPTION OF POTENTIAL HAZARDS

-Fire or explosion
-Exposure to petroleum fuels through inhalation, skin absorption or ingestion
-Vehicular traffic

PERSONNEL ACCESS

Personnel who attended LAW's site safety meeting and are authorized to enter this site:

1)_____ 7)_____
2)_____ 8)_____
3)_____ 9)_____
4)_____ 10)_____
5)_____ 11)_____
6)_____ 12)_____

Other personnel authorized to enter on a limited basis with an escort:

1)_____
2)_____

PLANNED FIELD ACTIVITIES

Install twelve Type II and two Type III monitoring wells, one 6-inch pumping well, advance 10 Hydropunch penetrometer probes, develop monitoring wells, collect soil and ground-water samples, conduct slug and pumping tests, and survey well locations.

MONITORING PROCEDURES

Ambient air monitoring for the presence of volatile organic compounds with a photoionization detector (PID) or organic vapor analyzer (OVA) will periodically be performed in the work area. Testing will be conducted for approximately three minutes at a minimum of one test per hour or at other times when site conditions (e.g. evidence of free product, increase in detectable odors, site workers sensitivity) exhibit the need for additional testing. In the event that ambient PID/OVA readings exceed a level of 50 ppm for more than one-half of any three-minute testing interval, the work area will be evacuated pending additional testing. The action level of 50 ppm represents the permissible exposure limit (PEL) for naphtha and coal tars as established by the Occupational Safety and Health Administration (OSHA) and the threshold limit value for butanol. If further testing reveals that ambient air contains volatile organic compounds in excess of 50 ppm, respirators designed for removal of toxic organics will required for

all site workers. Should concentrations exceed 1000 ppm, all site work will cease and the site will be evacuated pending guidance from the Corporate Health and Safety Officer.

DECONTAMINATION (Petroleum products)

Skin	-	wash with soap and water
Clothing	-	wash with detergent and rinse thoroughly
Equipment	-	steam clean or detergent wash

MEDICAL SURVEILLANCE

Avoid frequent or prolonged skin contact. Monitor skin and eyes for dermatitis, allergic reaction, and eye irritation. If these or other symptoms develop, seek qualified medical attention. Workers with histories of liver, kidney, or nervous disorders should be advised as to possible increased risk.

Symptoms of Acute Exposure to Volatile Organics: High vapor levels can cause irritation of the respiratory tract, headaches, nausea and mental confusion. Loss of consciousness occurs with very high concentrations. Liquid contact with skin may cause defatting, drying and irritation. Both vapor and liquid phases are irritating to the eyes.

EMERGENCY PROCEDURES (Petroleum products)

Skin	-	wash with soap and water, rinse well
Inhalation	-	move to fresh air at least 50 feet upwind from vapor source. Seek qualified medical attention.
Eyes	-	flush for a minimum of ten minutes with clean water while holding eyes open. Seek qualified medical attention.
Ingestion	-	do not induce vomiting. If conscious, give water or milk to drink. Seek qualified medical attention.

HEAT STRESS

Symptoms of heat stress include pale, cool or moist skin, excessive sweating, dizziness, nausea, and muscle spasms. Symptoms of heat stroke include red, hot and unusually dry skin, reduced perspiration, nausea, dizziness or confusion, rapid pulse rate and coma.

To prevent heat stress, adjust work schedule, provide shaded rest areas, and maintain body fluids.

CLOTHING AND PROTECTIVE GEAR**

Nitrile rubber gloves, latex gloves, steel-toes boots, protective eyewear, hard hats, and hearing protection and respirator shall be available at the work site.

**The Project Manager or the Principal Professional should be contacted prior to changes in personal protective equipment usage.

IN THE EVENT OF PERSONNEL INJURY

Provide basic first aid procedures as required and note time and circumstances of injuries. In the event of serious injury, the base hospital may be used (Drawing 1). Minor injuries and non-emergency cases should be treated off-base at Carteret General Hospital, 3500 Arendell Street in Morehead City. Notify Health and Safety Officer and Principal Project Professional.

IN THE EVENT OF POTENTIAL OR ACTUAL FIRE OR EXPLOSION

Evacuate the area immediately. Assemble in the predesigned area and conduct a head count of all personnel. Notify fire department. DO NOT attempt to fight the fire. Notify Project Manager.

WORK PRECAUTIONS

1) No smoking, eating, drinking or chewing of gum or tobacco products while on the site. Avoid hand to mouth contact. A designated smoking and break area may be established off-site. Any such facility must be a minimum of 100 feet from any vapor source and shall be tested for flammable gasses and vapors at the start of work and prior to scheduled break periods each day.

2) Hard hats, safety glasses and steel-toed boots are required to be worn at all times during drilling activities. Persons exposed to vehicular traffic will wear warning vests.

3) When the potential exists for skin contact with liquid hydrocarbons, impervious gloves and foot coverings are required to be worn.

4) Decontamination of equipment, clothing and personnel shall be in accordance with the previous section entitled "Decontamination".

5) Personnel must wash all exposed skin areas with soap and water before departing the site or going on break.

6) Prior to the start of work, all LAW employees and Subcontractor personnel shall be briefed on the contents of this plan by the LAW Field Representative.

FIELD REPRESENTATIVE SUMMARY

During the work covered by this Safety Plan, there were:

___No observed violations of the Safety Plan provisions.

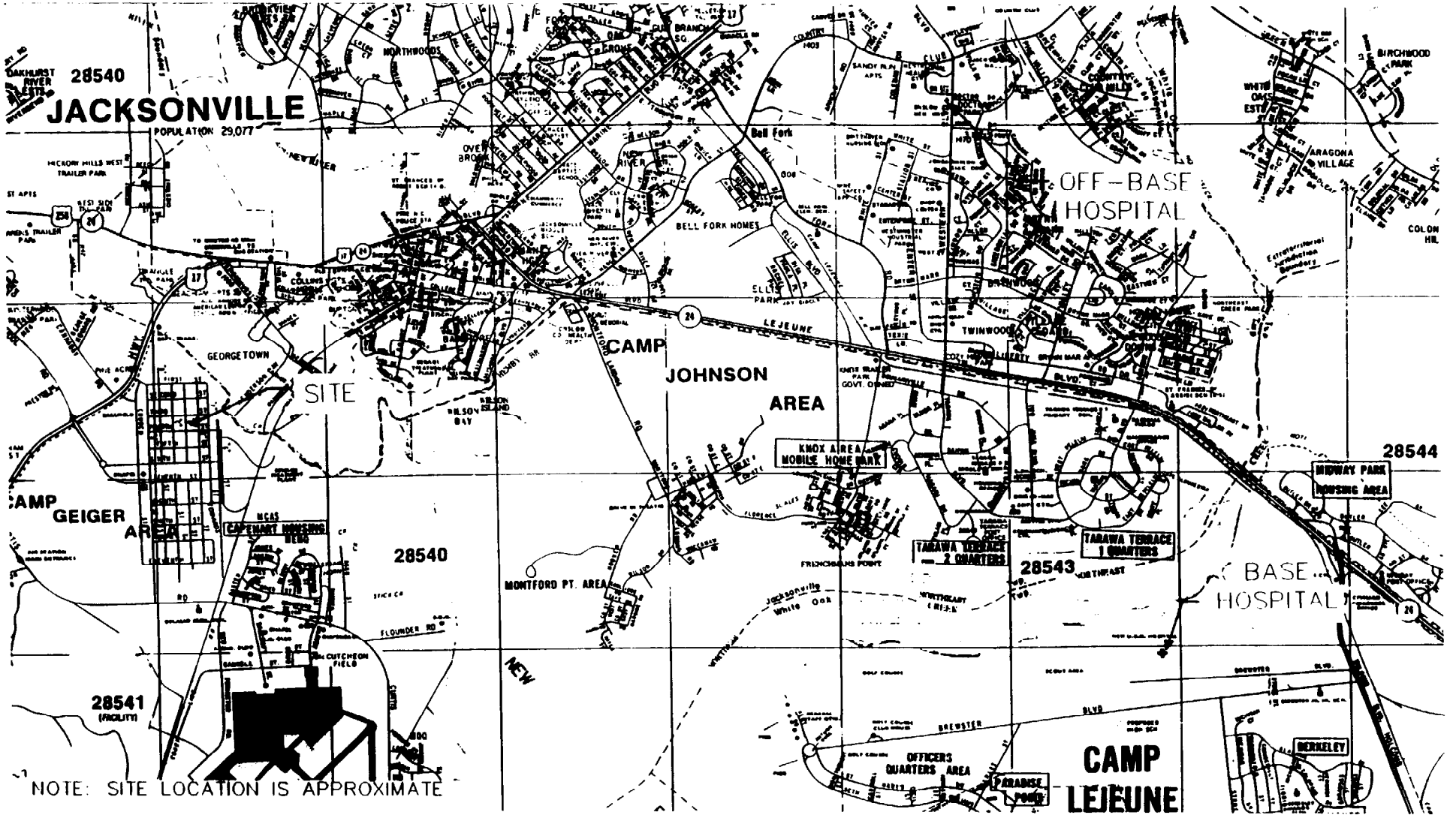
___The following violations of the Safety Plan provisions (give details in space below and indicate corrective action taken for each violation noted).

_____
_____
_____
_____
_____

Signature_____ Date_____
Field Representative

Attachments

Drawing 1 Hospital Route Map



BASE AND OFF-BASE HOSPITAL LOCATIONS
BUILDING TC-341
MARINE CORPS AIR STATION – CAMP LEJEUNE, NORTH CAROLINA
CONTRACT NO. 62470-93-D-4020

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

DRAWN: Dope Dmg	ENG CHECK: TLL	DATE: NOVEMBER 1993	JOB: 475-09183-01
DFT CHECK: MCM	APPROVAL: BJB	SCALE:	DWG: 1

DRAFT

APPENDIX B

SOIL TEST BORING RECORDS

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100	
0.0				
1.0	Topsoil (medium to dark brown slightly silty fine SAND). (SM)		●	11
	Brownish tan slightly silty fine SAND. (SM)			
3.5	Light tan with orange brown mottling clayey fine SAND to slightly clayey fine sand. (SC)		●	7
8.5				
8.8	Light tan clayey fine SAND. (SC)			
9.2	Light gray slightly silty medium to coarse SAND. (SM)		●	8
	Orange slightly silty medium to coarse SAND. (SM)			
13.5	Medium to dark gray slightly silty fine SAND. (SM)		●	*WH
15.0				

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Records for details.
*Weight of hammer

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-4
DATE DRILLED	March 1, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100	
0.0				
1.0	Topsoil			
	Dark brown slightly silty fine SAND. (SM)		●	16
3.5	Light to medium gray clayey fine SAND. (SC)		●	7
8.5	Light to medium gray clayey fine SAND. (SC)		●	10
13.5				
14.5	Very dark gray clayey fine SAND. (SC)		●	16
15.0	Very dark gray slightly silty fine SAND. (SM)			

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-5
DATE DRILLED	March 1, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT (0 10 20 30 40 60 80 100)
0.0			
1.0	Topsoil, dark brown slightly silty fine SAND. (SM)		5
	Brownish tan clayey fine SAND. (SC)		
3.5	Brownish tan to light gray clayey fine sand to silty clayey fine to medium SAND. (SC)		4
8.5	Tan slightly clayey, slightly silty fine to medium SAND. (SM)		16
13.5	Very dark gray slightly silty fine SAND. (SM)		3
15.0			

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-6
DATE DRILLED	March 1, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT	
0.0		0	10 20 30 40 60 80 100	
0.5	Topsoil			
1.0	Brownish tan slightly clayey fine SAND. (SM)		●	11
	Brownish tan fine sandy CLAY. (CL)			
3.5				
4.0	Brownish tan fine sandy CLAY. (CL)		●	22
	Gray and yellowish brown slightly silty fine to medium SAND. (SM)			
8.5				
9.8	Brownish tan clayey fine SAND. (SC)		●	16
	Orange slightly silty fine to medium SAND. (SM)			
13.5				
15.0	Orange brown slightly silty fine SAND. (SM)		●	7

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

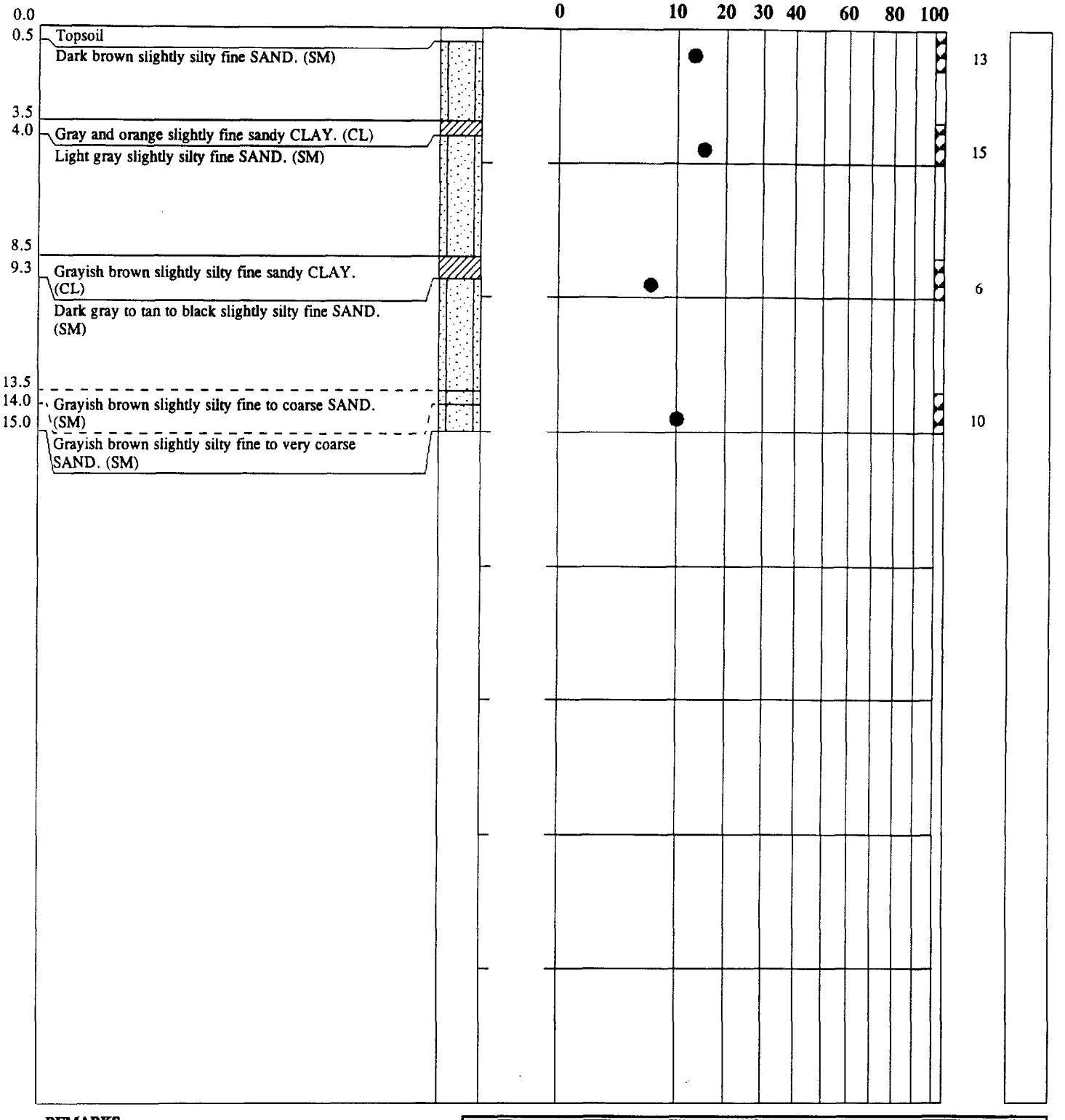
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-7
DATE DRILLED	March 1, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT



REMARKS:

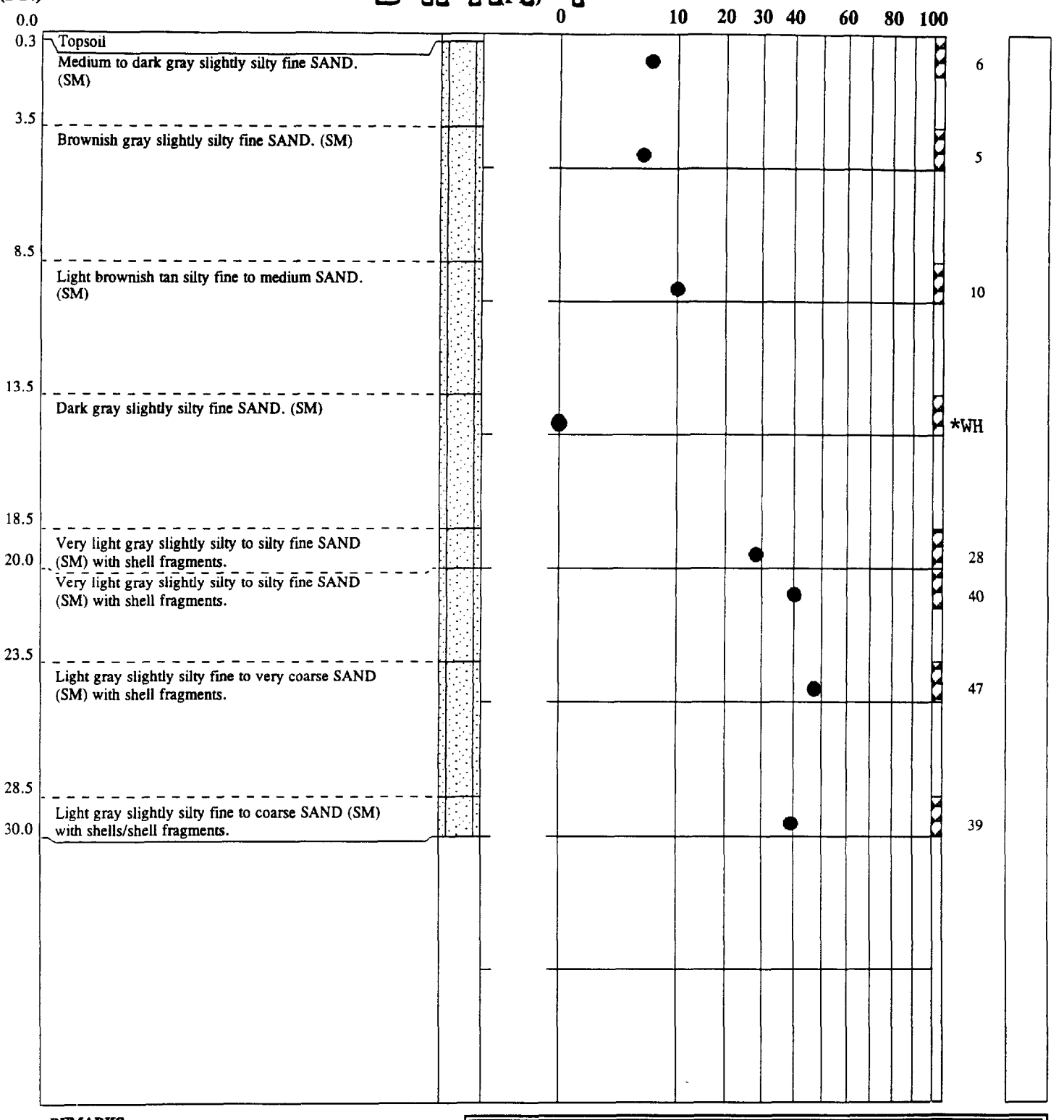
Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-8
DATE DRILLED	March 1, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING



REMARKS:

Boring terminated at 30.0 feet. Type III monitoring well installed upon boring completion. See Well Construction Record for details.
*Weight of hammer

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-9
DATE DRILLED	March 3, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100	
0.0	Tan and brown silty to slightly silty fine SAND. (SM)		●	9
3.5	Yellowish brown to tan silty to slightly silty fine SAND. (SM)		●	12
8.5	Orange brown silty fine to coarse SAND (SM) trace of pebbles.		●	7
13.5	Dark gray slightly silty fine SAND. (SM)		●	*WH
15.0				

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.
*Weight of hammer

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-10
DATE DRILLED	March 3, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT (0 10 20 30 40 60 80 100)
0.0			
0.5	Topsoil		
	Tan and dark brown silty to slightly silty fine SAND. (SM)		7
3.5			
	Medium gray, yellowish brown and dark brown clayey fine SAND. (SC)		11
8.5			
9.2	Tan and dark brown slightly clayey fine SAND. (SC)		7
	Orange brown and tan slightly silty to silty fine to very coarse SAND. (SM)		
13.5			
14.3	Orange brown and tan slightly silty medium to very coarse SAND. (SM)		6
15.0			
	Very dark grayish brown slightly silty fine SAND. (SM)		

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-11
DATE DRILLED	March 4, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT 0 10 20 30 40 60 80 100	
0.0				
0.5	Topsoil Black and dark tan slightly silty fine SAND. (SM)		●	12
3.5	Medium to dark gray slightly silty fine SAND. (SM)		●	4
8.5	Tan to yellowish brown slightly silty to silty fine to coarse SAND. (SM)		●	2
13.5	Dark gray slightly silty fine SAND. (SM)		●	*WH
15.0				

REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.
*Weight of hammer

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-12
DATE DRILLED	March 7, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION - BLOWS/FOOT (0 10 20 30 40 60 80 100)
0.0			
0.5	Yellowish brown slightly clayey fine SAND. (SC)		
	Yellowish brown fine sandy CLAY. (CL)		7
3.5	Brownish tan slightly silty fine to medium SAND. (SM)		7
8.5			
9.0	Brownish tan slightly silty fine to coarse SAND. (SM)		
9.5	Brownish orange fine sandy CLAY. (SC)		10
	Dark gray slightly silty fine SAND. (SM)		
13.5			
15.0	Light gray to dark gray slightly silty fine SAND. (SM)		2

REMARKS:

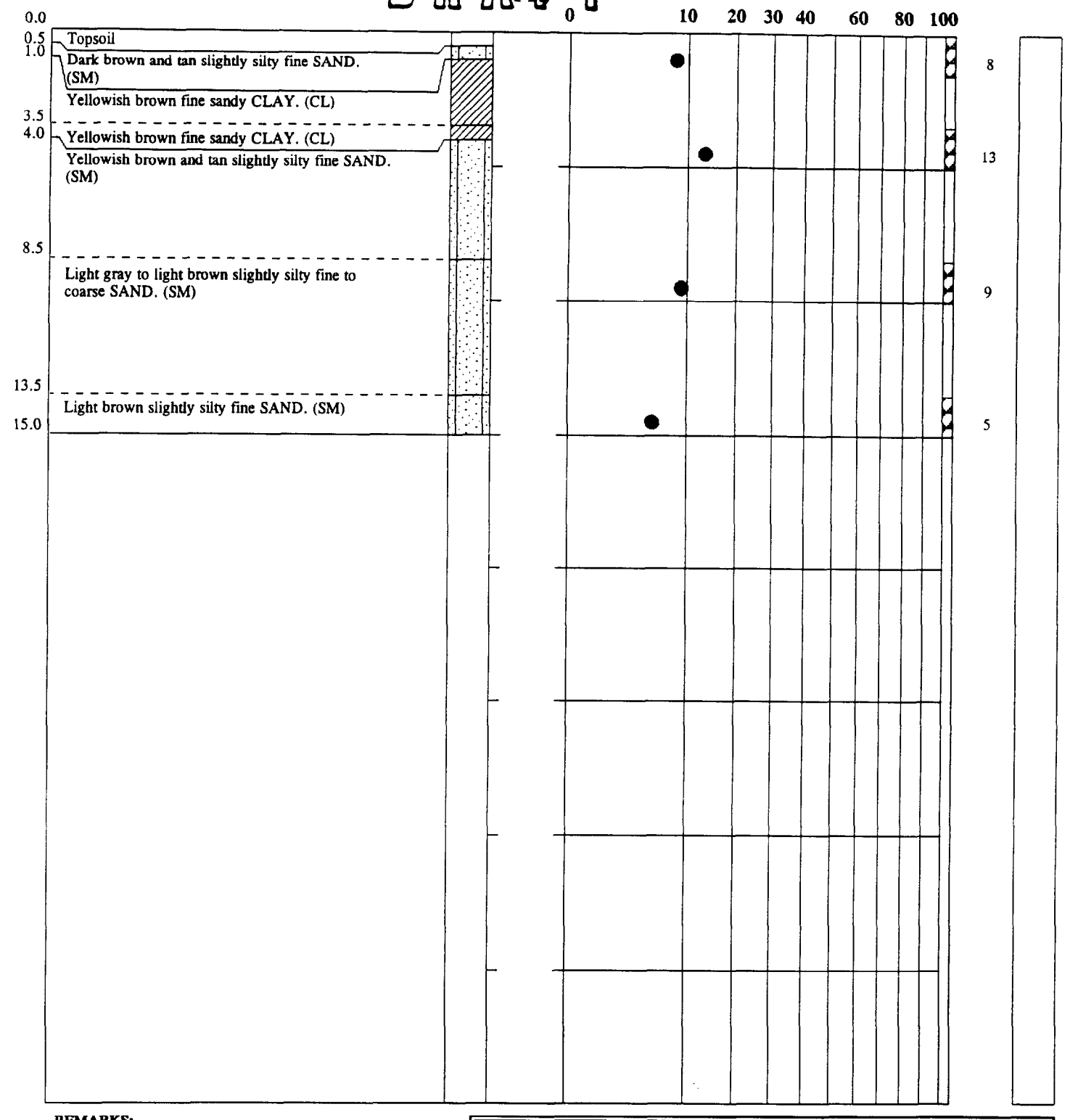
Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-13
DATE DRILLED	March 7, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING



REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

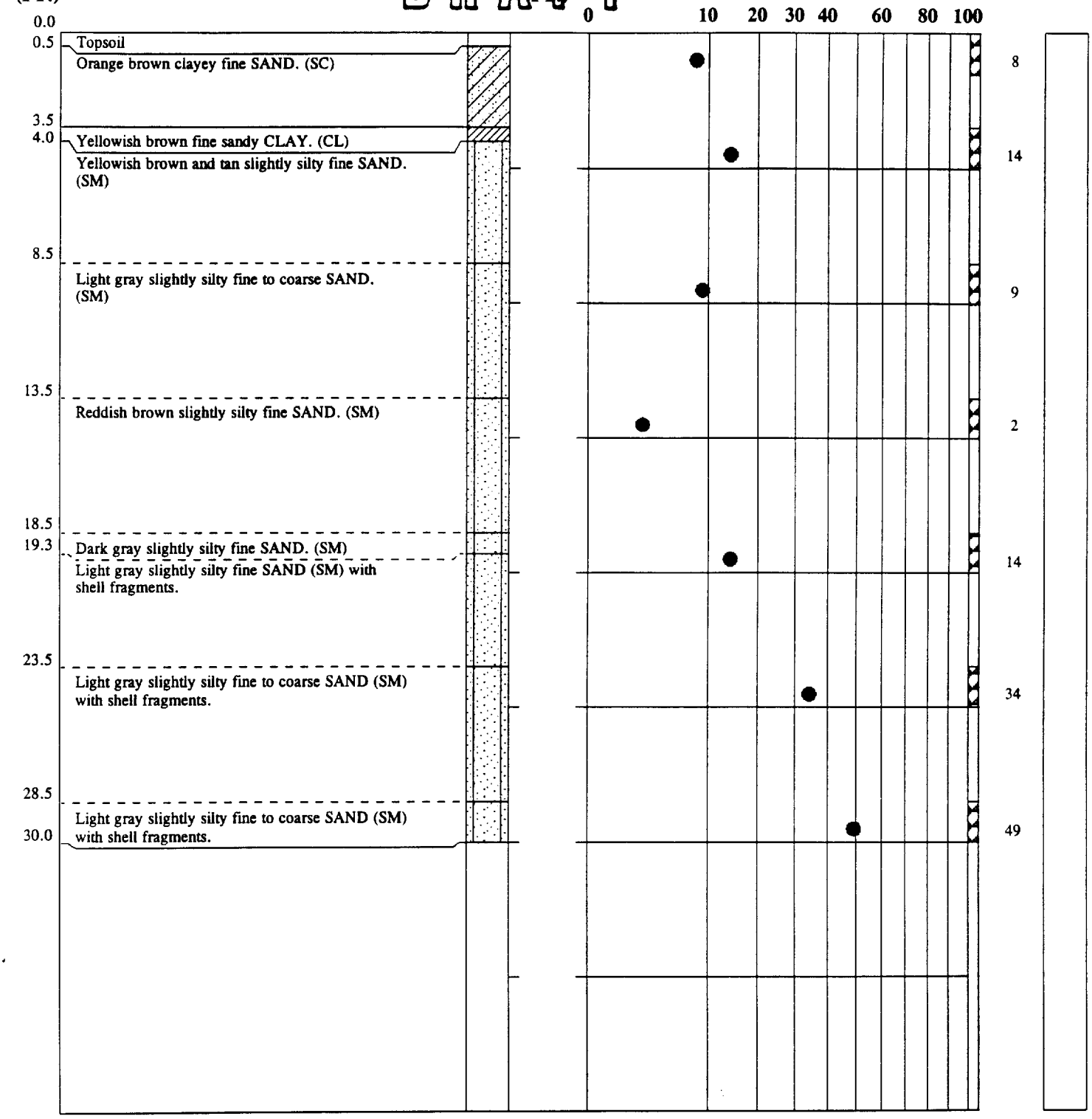
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-14
DATE DRILLED	March 8, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT



REMARKS:

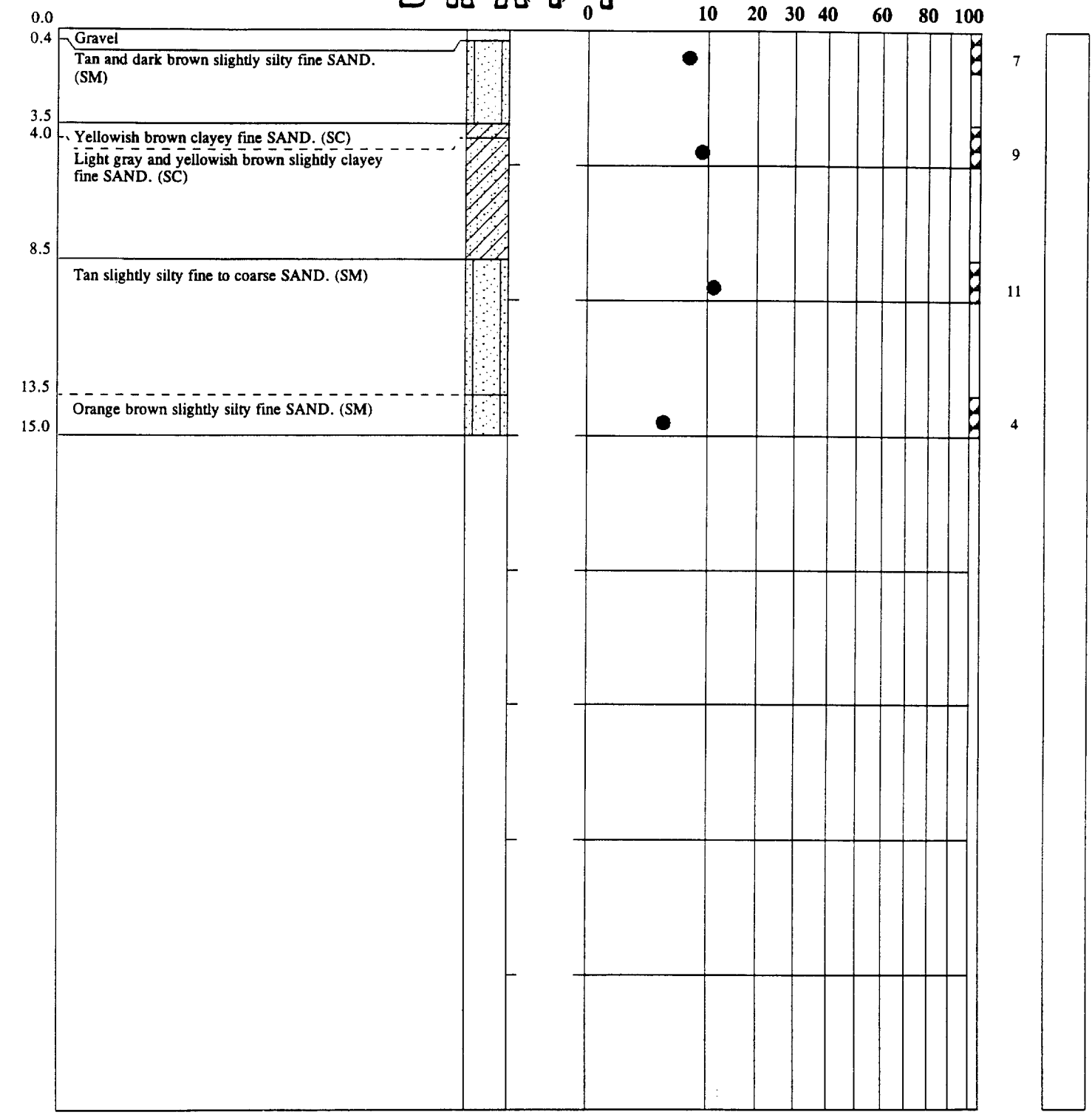
Boring terminated at 30.0 feet. Type III monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-15
DATE DRILLED	March 8, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING



REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

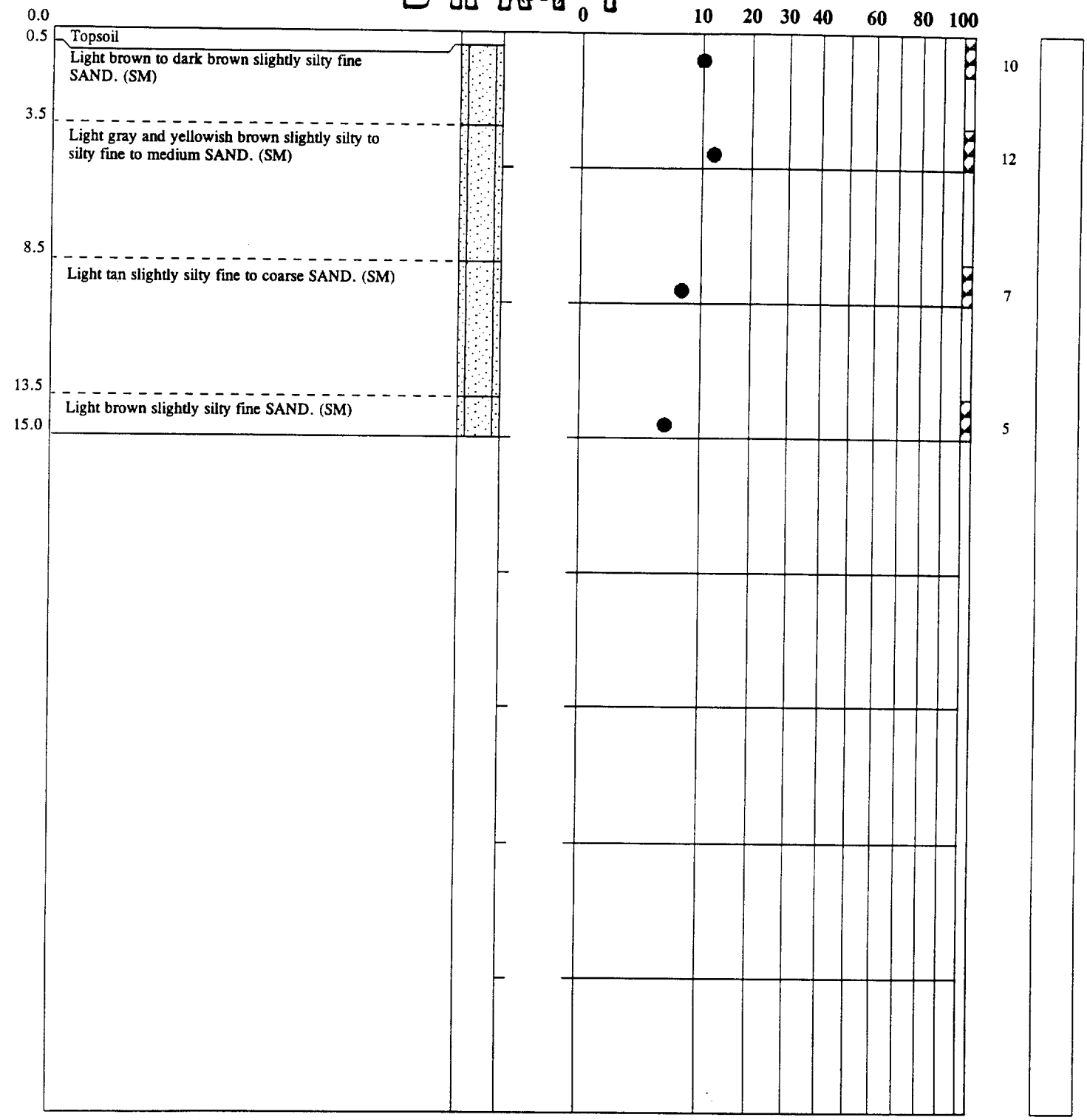
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-16
DATE DRILLED	March 8, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

DRAFT



REMARKS:

Boring terminated at 15.0 feet. Type II monitoring well installed upon boring completion. See Well Construction Record for details.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-17
DATE DRILLED	March 8, 1994
PROJECT NUMBER	475-09183-01
PROJECT	TC-341
PAGE 1 OF 1	

LAW ENGINEERING

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APPENDIX C

GRAIN SIZE DISTRIBUTION
HYDRAULIC CONDUCTIVITY CALCULATIONS

TC-341
MW-7

DRAFT

HYDRAULIC CONDUCTIVITY : GRAIN SIZE

MASH + DENNY

d_{16} = — ND
d_{84} = .27 ✓
d_5 = — ND
d_{95} = .42 ✓
d_{50} = ~~.90~~

D_{95}

$\phi = \frac{-\log(.42)}{\ln(2)} = \frac{(-)-0.377}{0.693} = +0.544$

ϕ = ~~.377~~ .544

D_{95} = 1.25 ϕ

D_{84}

$\phi = \frac{-\log(.27)}{\ln(2)}$

D_{84} = 1.89 ϕ

D_{50}

$\phi = -\log(.90)$

D_{50} = .15 ϕ

D_{16} = 0.0 ϕ

D_5 = 0.0 ϕ

$$J_1 = \frac{d_{16} - d_{84}}{4} + \frac{d_5 - d_{95}}{6.6}$$

$$= \frac{0.0 - 1.89}{4} + \frac{0.0 - 1.25}{6.6}$$

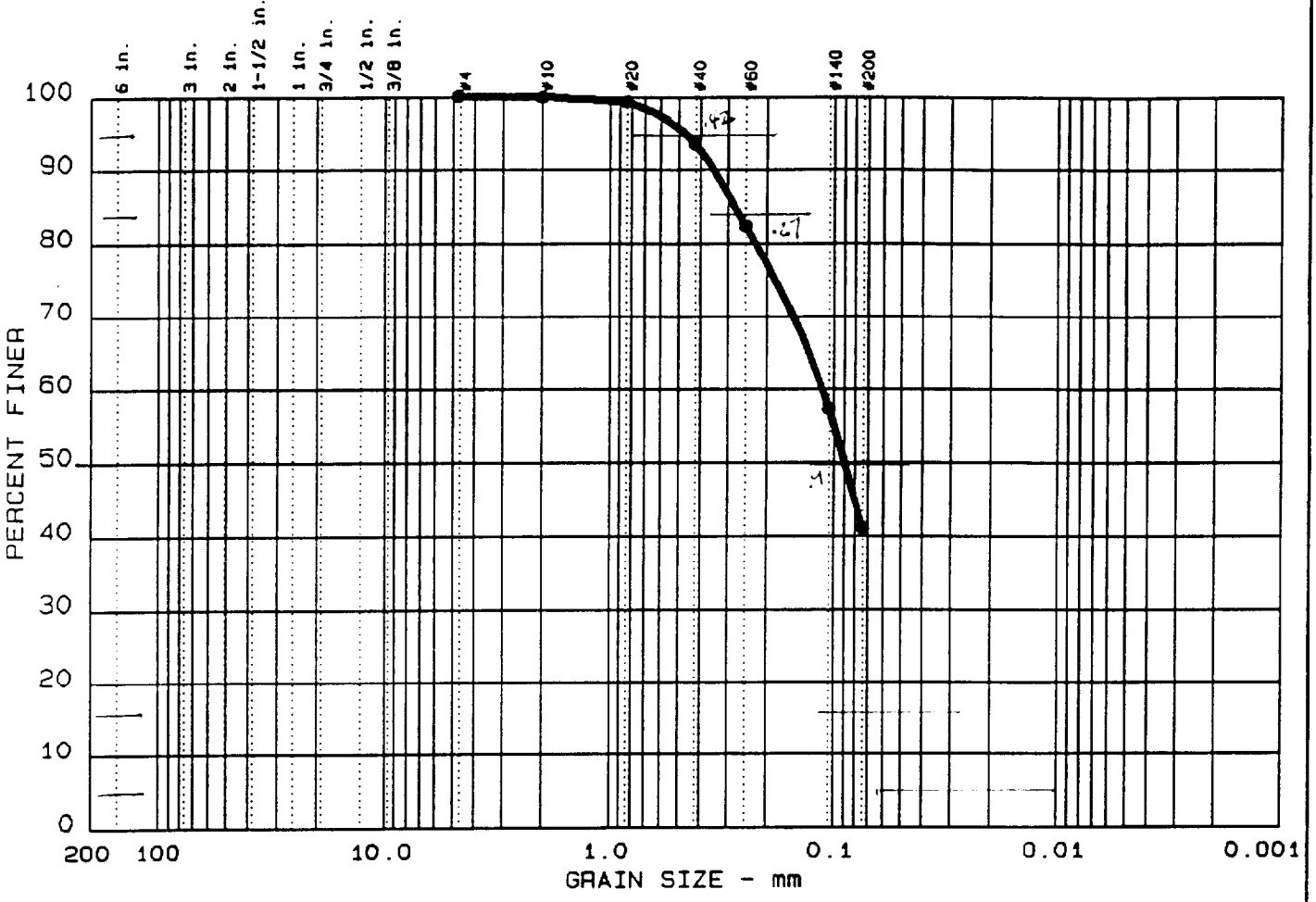
$$= -0.473 + -0.189$$

$$J_1 = -0.284 \; ?$$

THE EQUATION IS N/A BECAUSE d5 + d16 ARE ND (i.e. not Defined).
BJB 4/12/94

DRAFT

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	0.0	59.0	41.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●			0.28	0.11	0.09					

MATERIAL DESCRIPTION	USCS	AASHTO
● MW7 (SOIL) 8.5-10		

Project No.: 475-09183-01
Project: TC-341
● Location: MW7 (SOIL) 8.5-10

Date: 03-14-94

Remarks:

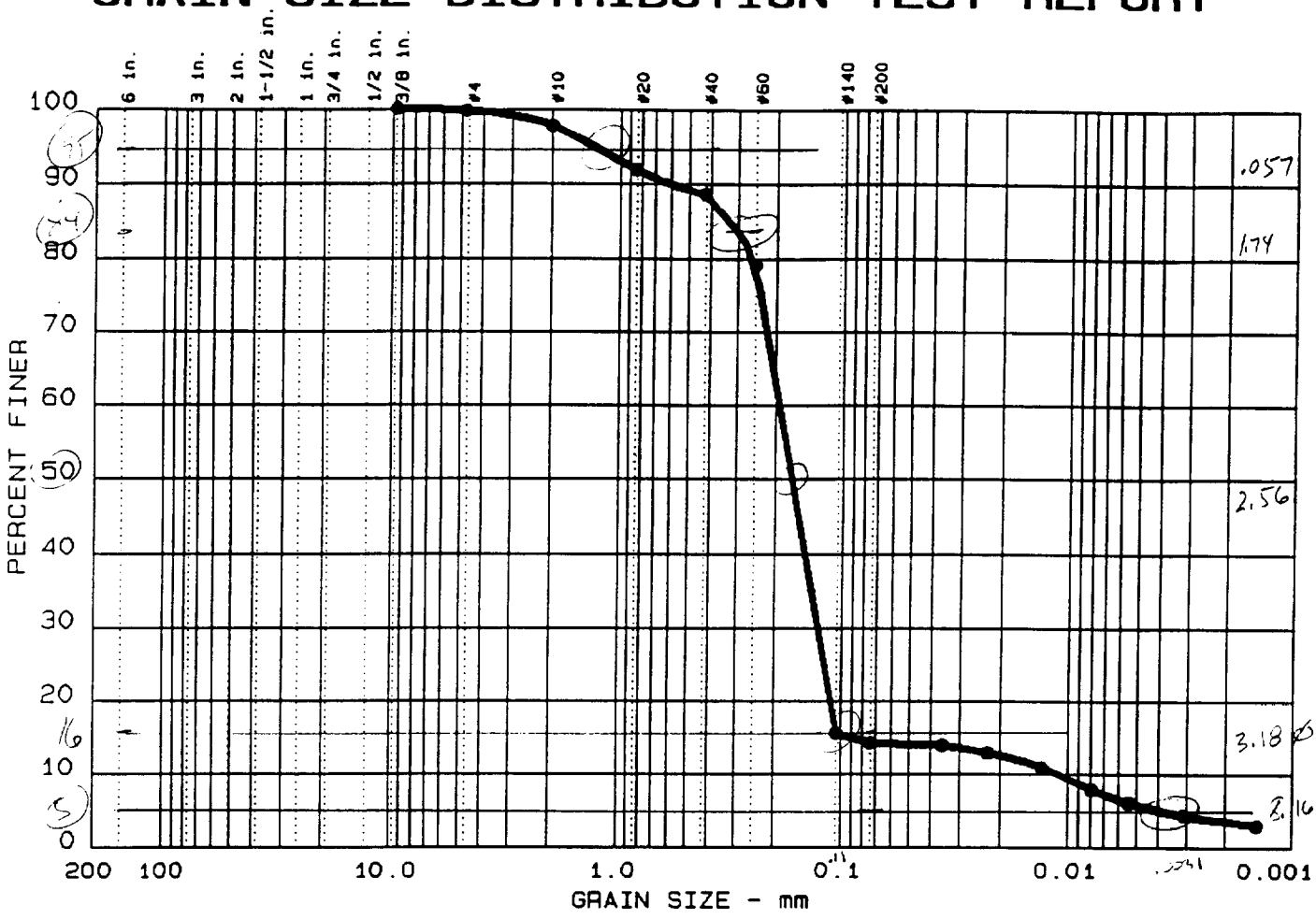
GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING

Figure No. 3

DRAFT

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.3	85.5	8.5	5.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.32	0.19	0.17	0.128	0.0905	0.0111	7.62	17.3

MATERIAL DESCRIPTION	USCS	AASHTO
● MW9 (SOIL) 20-21.5		

Project No.: 475-09183-01
Project: TC-341
● Location: MW9 (SOIL) 20-21.5

Date: 03-14-94

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING

Figure No. 4

DRAFT

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 4

L.. ..: 03-14-94
Project No.: 475-09183-01
Project: TC-341

Sample Data

Location of Sample: MW9 (SOIL) 20-21.5
Sample Description: MW9 (SOIL) 20-21.5
USCS Class: Liquid limit:
AASHTO Class: Plasticity index:

Notes

Remarks:

Fig. No.: 4

Mechanical Analysis Data

Initial
Dry sample and tare= 468.51
Tare = 0.00
Dry sample weight = 468.51
...le split on number 10 sieve
...c sample data:
Sample and tare = 91.57 Tare = 0 Sample weight = 91.57
Cumulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
0.375 inches	0.00	100.0
# 4	1.18	99.7
# 10	10.85	97.7
# 20	5.46	91.9
# 40	8.47	88.6
# 60	17.40	79.1
# 140	77.00	15.5
# 200	78.26	14.2

Hydrometer Analysis Data

Separation sieve is number 10
Percent -# 10 based on complete sample= 97.7
Weight of hydrometer sample: 91.57
Calculated biased weight= 93.74
Automatic temperature correction
Composite correction at 20 deg C =-4.9

Meniscus correction only=-1

Specific gravity of solids= 2.65
Specific gravity correction factor= 1.000
Hydrometer type: 152H Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
2.0	20.0	18.0	13.1	0.0136	17.0	13.5	0.0355	13.9
5.0	20.0	17.0	12.1	0.0136	16.0	13.7	0.0226	12.9
15.0	20.5	15.0	10.2	0.0136	14.0	14.0	0.0131	10.8
42.0	21.5	12.0	7.4	0.0134	11.0	14.5	0.0079	7.9
89.0	22.5	10.0	5.6	0.0132	9.0	14.8	0.0054	6.0
268.0	24.0	8.0	4.1	0.0130	7.0	15.1	0.0031	4.3
1279.0	23.0	7.0	2.8	0.0132	6.0	15.3	0.0014	2.9

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 75mm. = 0.0 % GRAVEL = 0.3 % SAND = 85.5
% SILT = 8.5 % CLAY = 5.7

D85= 0.32 D60= 0.193 D50= 0.168
D30= 0.1278 D15= 0.09047 D10= 0.01113
Cc = 7.6208 Cu = 17.2982

LAW ENGINEERING
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS
3301 ATLANTIC AVE.
P.O. BOX 18288
RALEIGH, NC 27619
919-876-0416

DRAFT

JOB NO. 475-09183-01 SHEET ____ OF ____
JOB NAME Tank TC-341
SUBJECT ____
BY J.T DATE 4-13-94
CHECKED BY JLL DATE 4.13.94

Calculation of Hydraulic Conductivity

A) Hazen Method

Reference: Groundwater Engineering, Kashef, P. 87

$K = C_h \cdot P_{10}^{\,2}$ where, $C_h = 100$

$0.1 < D_{10} < 3.0$

$C_u \leq 5.0$

Cannot used Hazen: $C_u = 17.3$ > outside of range
$D_{10} = 0.011$

B) Masch & Denny

$K = f(\sigma_I, d_{50})$

Grain size Data

$d_{16} = 0.12$

$d_{84} = 0.30$

$d_5 = 0.005$ ✓

$d_{95} = 1.33$

$d_{50} = 0.17\text{mm}$

Convert to krumbein units ϕ

$d_{16} \Rightarrow \phi = \frac{-Ln(0.12\,mm)}{Ln(2)} \Rightarrow \phi = 3.06$ $\quad d_{16} = 3.06\phi$ ✓

$d_{84} \Rightarrow \phi = \frac{-Ln(0.30mm)}{Ln(2)} \Rightarrow \phi = 1.74$ $\quad d_{84} = 1.74\phi$ ✓

$d_5 \Rightarrow \phi = \frac{-Ln(0.005\,mm)}{Ln(2)} \Rightarrow \phi = 7.64$ $\quad d_5 = 7.64\phi$ ✓

$d_{95} \Rightarrow \phi = \frac{-Ln(1.33mm)}{Ln(2)} \Rightarrow \phi = -0.41$ $\quad d_{95} = -0.41\phi$ ✓

$d_{50} \Rightarrow \phi = -Ln(0.17mm) \Rightarrow \phi = 2.56$ $\quad d_{50} = 2.56\phi$ ✓

$\sigma_I = \frac{d_{16} - d_{84}}{4} + \frac{d_5 - d_{95}}{6.6} \Rightarrow \sigma_I = \frac{3.06 - 1.74}{4} + \frac{7.64 - (-0.41)}{6.6} \Rightarrow$

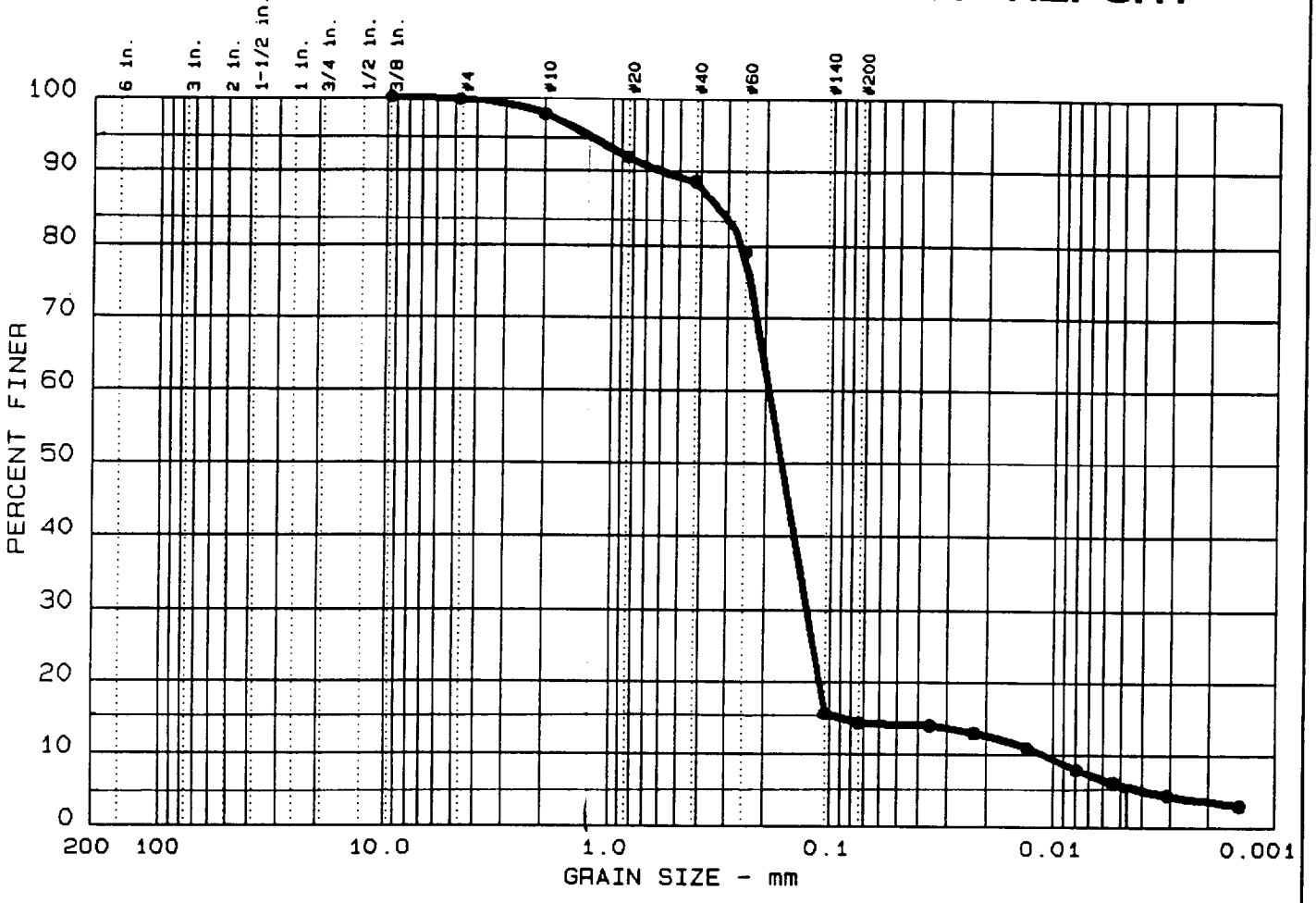
$\Rightarrow \sigma_I = 0.33 + 1.22 \Rightarrow \sigma_I = 1.55$ ✓

$d_{50} = 2.56\phi \Rightarrow K = 0.49 \frac{cm}{min}$ (reference Masch & Denny, 1966)

$K = 0.49 \frac{cm}{min}\left(\frac{1\,in}{2.54cm}\right)\left(\frac{1\,FT}{12\,in}\right)\left(\frac{60\,min}{HR}\right)\left(\frac{24\,HR}{Day}\right) = \boxed{23.1 \frac{FT}{DAY}}$

DRAFT

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.3	85.5	8.5	5.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.32	0.19	0.17	0.128	0.0905	0.0111	7.62	17.3

MATERIAL DESCRIPTION	USCS	AASHTO
● MW9 (SOIL) 20-21.5		

Project No.: 475-09183-01
Project: TC-341
● Location: MW9 (SOIL) 20-21.5

Date: 03-14-94

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING

Figure No. 4

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 4

L .: 03-14-94
Project No.: 475-09183-01
Project: TC-341

Sample Data

Location of Sample: MW9 (SOIL) 20-21.5
Sample Description: MW9 (SOIL) 20-21.5
USCS Class: Liquid limit:
AASHTO Class: Plasticity index:

Notes

Remarks:

Fig. No.: 4

Mechanical Analysis Data

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# 40	8.47	88.6
# 60	17.40	79.1
# 140	77.00	15.5
# 200	78.26	14.2

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Percent -# 10 based on complete sample= 97.7
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utomatic temperature correction
Composite correction at 20 deg C =-4.9

eniscus correction only=-1

Specific gravity of solids= 2.65
Specific gravity correction factor= 1.000
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Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
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5.0	20.0	17.0	12.1	0.0136	16.0	13.7	0.0226	12.9
15.0	20.5	15.0	10.2	0.0136	14.0	14.0	0.0131	10.8
42.0	21.5	12.0	7.4	0.0134	11.0	14.5	0.0079	7.9
89.0	22.5	10.0	5.6	0.0132	9.0	14.8	0.0054	6.0
268.0	24.0	8.0	4.1	0.0130	7.0	15.1	0.0031	4.3
1279.0	23.0	7.0	2.8	0.0132	6.0	15.3	0.0014	2.9

Fractional Components

Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 75mm. = 0.0 % GRAVEL = 0.3 % SAND = 85.5
% SILT = 8.5 % CLAY = 5.7

D85= 0.32 D60= 0.193 D50= 0.168
D30= 0.1278 D15= 0.09047 D10= 0.01113
Cc = 7.6208 Cu = 17.2982

LAW ENGINEERING
SOILS LABORATORY ASSIGNMENTS

No. _____ PRIORITY _____ _____

DEPT. # _____

DATE 2-7-84 JOB NAME TC-241 JOB NO. 45-[illegible] IN CHARGE [illegible] REQUESTED COMPLETION DATE 2-10

SAMPLE LOCATION			PHYSICAL PROPERTIES											STRENGTH TESTS								COM-PACTION			CONSOLIDATION	SPECIAL TEST
BORING NO.	SAMPLE TYPE	SAMPLE DEPTH	COMBINED ANALYSIS (LI)	MOISTURE CONTENT	UNIT WEIGHT NAT. DEN. & MOIST. CONT.	SPECIFIC GRAVITY	ATTERBERG LIMITS	SHRINKAGE LIMITS	DRY	GRAIN SIZE ANALYSIS: WASH 200 W/SEIVE	GRAIN SIZE ANALYSIS: % FINER NO. 200	GRAIN SIZE ANALYSIS: HYDROMETER	MAX. & MIN. DENSITY	SWELL TEST		UNCONFINED COMP. WITH/STRESS-STRAIN CURVE	UNCONFINED COMP. WITHOUT S-S CURVE	TRIAXIAL UU	TRIAXIAL CU	TRIAXIAL CU W/PP	CONFINING PRESSURES, KSF	STANDARD (A, B, C, D)	MODIFIED (A, B, C, D)	CBR	INDICATE LOADS IN KIPS AND RELOAD CYCLE IF ANY	
17	Soil	2½																								
19	Soil	20-21																								
17	Soil	4-5½																								

REMARKS _____

DRAFT

APPENDIX D

WELL CONSTRUCTION RECORDS

North Carolina - Department of Environment, Health and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY	
QUAD. NO:	SERIAL NO:
Lat.	Long. RO:
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-4

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-1-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

16. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Wayne L. Nelson — 4-11-94

SIGNATURE OF CONTRACTOR OR AGENT — DATE

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY	
QUAD. NO:	SERIAL NO:
Lat.	Long. RO:
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-5

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-1-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 1.9 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): N/A

11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	PVC
From	To	Ft.		

REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Wayne J. Wilkinson 4-11-94

SIGNATURE OF CONTRACTOR OR AGENT DATE

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY
QUAD. NO: _____ SERIAL NO: _____
Lat. _____ Long. _____ RO: _____
Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent: _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-6

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Geiger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-1-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 1.9 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

   YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

16. REMARKS: _____

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Wayne B. Wilkinson 4-11-94

SIGNATURE OF CONTRACTOR OR AGENT DATE

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

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Lat.	Long. RO:
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-7

DRILLER REGISTRATION NUMBER: 332

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-1-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 1.9 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

16. REMARKS:

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 4-11-94

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Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent: ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-8

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-1-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS flush FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

13. GROUT:

Depth			Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

Depth			Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

Depth			Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

REMARKS: ______

DRILLING LOG

DEPTH From	DEPTH To	Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 4-11-94
SIGNATURE OF CONTRACTOR OR AGENT DATE

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Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent: ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-9

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-3-94 USE OF WELL Monitoring
4. TOTAL DEPTH 32.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	32.0	See attached

If additional space is needed use back of form

12. CASING:

	Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	22.0 Ft.	6"	SCH 40	PVC
From	0.0	27.0 Ft.	2"	SCH 40	PVC
From		Ft.			

13. GROUT:

	Depth From	To	Material	Method
From	0.0	3.0 Ft.	Concrete	Cast-in-Place
From	0.0	22.0 Ft.	Portland Cement and Bentonite	Tremie

14. SCREEN:

	Depth From	To	Diameter	Slot Size	Material
From	27.0	32.0 Ft.	2" in.	0.010 in.	PVC
From		Ft.	in.	in.	
From		Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth From	To	Size	Material
From	24.5	33.0 Ft.	Torpedo	Sand
From		Ft.		

REMARKS: ______

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Report

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 4-11-94

SIGNATURE OF CONTRACTOR OR AGENT DATE

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Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

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Minor Basin ______
Basin Code ______
Header Ent. ______ GW-1 Ent: ______

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-10

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U. S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville, NC
   City or Town State Zip Code
3. DATE DRILLED 3-3-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: ______ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 1.95 FT. Above Land Surface*
   * Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

Depth From	To	Ft. Diameter	Wall Thickness or Weight/Ft.	Material
0.0	3.0	2"	SCH 40	PVC

13. GROUT:

Depth From	To	Material	Method
0.0	2.0	Concrete	Cast-in-Place

14. SCREEN:

Depth From	To	Diameter (in.)	Slot Size (in.)	Material
3.0	13.0	2"	0.010	PVC

15. SAND/GRAVEL PACK:

Depth From	To	Size	Material
2.0	14.0	Torpedo	Sand

16. REMARKS:

DRILLING LOG

DEPTH From	To	Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 4-11-94
SIGNATURE OF CONTRACTOR OR AGENT DATE

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Division of Environmental Management - Groundwater Section
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Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-11

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-4-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 1.95 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

   YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	To	3.0 Ft.	2"	SCH 40	PVC
From		To	Ft.			
From		To	Ft.			

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Report

13. GROUT:

	Depth			Material	Method
From	0.0	To	2.0 Ft.	Concrete	Cast-in-Place
From		To	Ft.		

14. SCREEN:

	Depth			Diameter	Slot Size	Material
From	3.0	To	13.0 Ft	2" in.	0.010 in.	PVC
From		To	Ft.	in.	in.	
From		To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	2.0	To	14.0 Ft.	Torpedo	Sand
From		To	Ft.		

. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

4-11-94

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Minor Basin _____
Basin Code _____
Header Ent. _____ GW-1 Ent.: _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-12

DRILLER REGISTRATION NUMBER: 332

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-7-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	To 3.0 Ft.	2"	SCH 40	PVC
From		To Ft.			
From		To Ft.			

13. GROUT:

	Depth		Material	Method
From	0.0	To 2.0 Ft.	Concrete	Cast-in-Place
From		To Ft.		

14. SCREEN:

	Depth		Diameter	Slot Size	Material
From	3.0	To 13.0 Ft	2" in.	0.010 in.	PVC
From		To Ft.	in.	in.	
From		To Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From	2.0	To 14.0 Ft.	Torpedo	Sand
From		To Ft.		

16. REMARKS: _____

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT — DATE 4-1-94

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Basin Code	
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WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-13

DRILLER REGISTRATION NUMBER: 332

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-7-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 2.0 FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

YIELD (gpm): N/A METHOD OF TEST N/A

J. WATER ZONES (depth): N/A

11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

REMARKS: _____

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 4-11-94

North Carolina - Department of Environment, Health, and Natural Resources
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Phone (919) 733-3221

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Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-14

DRILLER REGISTRATION NUMBER: 332

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-8-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS flush FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A

11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached.

If additional space is needed use back of form

12. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From 0.0	To 3.0	Ft.	2"	SCH 40	PVC
From	To	Ft.			
From	To	Ft.			

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See attached.

13. GROUT:

	Depth		Material	Method
From 0.0	To 2.0	Ft.	Concrete	Cast-in-Place
From	To	Ft.		

14. SCREEN:

	Depth		Diameter		Slot Size		Material
From 3.0	To 13.0	Ft	2"	in.	0.010	in.	PVC
From	To	Ft.		in.		in.	
From	To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth		Size	Material
From 2.0	To 14.0	Ft.	Torpedo	Sand
From	To	Ft.		

16. REMARKS: _____

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Wayne F. Pierson 4-11-94

SIGNATURE OF CONTRACTOR OR AGENT DATE

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Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-15

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-8-94 USE OF WELL Monitoring
4. TOTAL DEPTH 30.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS flush FT. Above Land Surface*

* *Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118*

YIELD (gpm): N/A METHOD OF TEST N/A

10. WATER ZONES (depth): N/A

11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	30.0	See attached.

If additional space is needed use back of form

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	To	22.0 Ft.	6"	SCH 40	PVC
From	0.0	To	25.0 Ft.	2"	SCH 40	PVC
From		To	Ft.			

13. GROUT: /Cement

	Depth			Material	Method
From	0.0	To	22.0 Ft.	Cement/Bentonite	Tremie
From	0.0	To	2.0 Ft.	Concrete	~~Cast-in-Place~~

14. SCREEN:

	Depth			Diameter	Slot Size	Material
From	25.0	To	30.0 Ft	2" in.	0.010 in.	PVC
From		To	Ft.	in.	in.	
From		To	Ft.	in.	in.	

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	23.0	To	30.0 Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS:

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature] 4-11-94

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

DRAFT

FOR OFFICE USE ONLY	
QUAD. NO:	SERIAL NO:
Lat.	Long. RO:
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-16

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-8-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [x] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [x]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS flush FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A

DEPTH From	DEPTH To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

12. CASING:

	Depth			Diameter	Wall Thickness or Weight/Ft.	Material
From	0.0	To	3.0 Ft.	2"	SCH 40	PVC
From		To	Ft.			
From		To	Ft.			

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

13. GROUT:

	Depth			Material	Method
From	0.0	To	2.0 Ft.	Concrete	Cast-in-Place
From		To	Ft.		

14. SCREEN:

	Depth			Diameter		Slot Size		Material
From	3.0	To	13.0 Ft	2"	in.	0.010	in.	PVC
From		To	Ft.		in.		in.	
From		To	Ft.		in.		in.	

15. SAND/GRAVEL PACK:

	Depth			Size	Material
From	2.0	To	14.0 Ft.	Torpedo	Sand
From		To	Ft.		

16. REMARKS: _____

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Shawn J. Steinmann 4-11-94

North Carolina - Department of Environment, Health, and Natural Resources
Division of Environmental Management - Groundwater Section
P.O. Box 29535 - Raleigh, N.C. 27626-0535
Phone (919) 733-3221

FOR OFFICE USE ONLY	
QUAD. NO:	SERIAL NO:
Lat.	Long. RO:
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent:

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR: Law Engineering

DRILLER REGISTRATION NUMBER: 332

STATE WELL CONSTRUCTION PERMIT NUMBER: MW-17

1. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Jacksonville County: Onslow
   TC-341 Camp Gieger
   (Road, Community, or Subdivision and Lot No.)
2. OWNER U.S. Marine Corps
   ADDRESS Camp LeJeune
   (Street or Route No.)
   Jacksonville NC
   City or Town State Zip Code
3. DATE DRILLED 3-8-94 USE OF WELL Monitoring
4. TOTAL DEPTH 13.0
5. CUTTINGS COLLECTED YES [X] NO [ ]
6. DOES WELL REPLACE EXISTING WELL? YES [ ] NO [X]
7. STATIC WATER LEVEL Below Top of Casing: _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS flush FT. Above Land Surface*

* Casing Terminated at/or below land surface is illegal unless a variance is issued in accordance with 15A NCAC 2C .0118

   YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): N/A
11. CHLORINATION: Type N/A Amount N/A
12. CASING:

	Depth From	To	Ft.	Diameter	Wall Thickness or Weight/Ft.	Material
	0.0	3.0		2"	SCH 40	PVC

13. GROUT:

	Depth From	To	Ft.	Material	Method
	0.0	2.0		Concrete	Cast-in-Place

14. SCREEN:

	Depth From	To	Ft.	Diameter		Slot Size		Material
	3.0	13.0	Ft	2"	in.	0.010	in.	PVC
					in.		in.	
					in.		in.	

15. SAND/GRAVEL PACK:

	Depth From	To	Ft.	Size	Material
	2.0	14.0		Torpedo	Sand

. REMARKS: _____

DEPTH From	To	DRILLING LOG Formation Description
0.0	13.0	See attached

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

See Report.

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

SIGNATURE OF CONTRACTOR OR AGENT _____ DATE

DRAFT

APPENDIX E

MONITORING WELL CASING AND WATER ELEVATION WORKSHEETS

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

ENVIRONMENTAL DEPARTMENT

MONITORING WELL CASING AND WATER ELEVATION WORKSHEET

PROJECT NAME TC-341 Camp Geiger JOB NUMBER 475-09183-01

LOCATION Camp Lejeune, North Carolina DATE 3/30/94

DESCRIPTION OF SURVEY DATUM Vertical datum based on existing concrete monument "STAFF" elevation 19.21 feet MSL

FIELD PERSONNEL Wilkinson/Whalen

MEASURING DEVICE(S) Slope Indicator (TM) Water-Level Meter

WELL NUMBER	MEASURING POINT CALCULATIONS			DEPTH TO WATER (FT)	ELEV OF WATER (FT)	PRODUCT THICKNESS (FT)	COMMENTS (ODOR, WELL COND., PROTECTIVE COVER CONDITION) CORRECTED W.T.EL
	ROD HEIGHT (FT)	INSTRUMENT HEIGHT (FT)	ELEV OF MEASURING POINT (1) (FT)				
MW-1			20.59	7.80	12.91	.15	Corrected Water Table Elevation
MW-2			21.13	10.10	12.69	2.08	Corrected Water Table Elevation
MW-3			20.49	7.68	12.81		Good Condition
MW-4			20.47	6.97	13.50		Good Condition
MW-5			19.79	6.54	13.25		Good Condition
MW-6			19.16	7.18	11.98		Good Condition
MW-7			19.12	7.28	11.84		Good Condition
MW-8			16.56	5.01	11.55		Good Condition
MW-9			19.36	7.32	12.04		Good Condition
MW-10			19.31	6.85	12.46		Good Condition
MW-11			19.21	6.90	12.31		Good Condition
MW-12			19.75	6.61	13.14		Good Condition
MW-13			17.79	6.86	10.93		Good Condition
MW-14			16.31	5.52	10.79		Good Condition
MW-15			16.20	5.69	10.51		Good Condition
MW-16			16.53	4.66	11.87		Good Condition
MW-17			16.14	5.03	11.11		Good Condition

(1) Measuring point top of casing unless otherwise noted.
ND = None detected; equipment capable of measuring ≥0.01 feet.

DRAFT

APPENDIX F

GROUND-WATER FLOW DIRECTION

JOB NAME: BUILDING TC-341
JOB NO.: 475-09183-01
WELL NO.: MW-4

DRAFT

TEST BY/DATE: WILKENSON/3-30-94
ENTERED BY/DATE: BELLIS/4-13-94
CHECKED/DATE: WILKENSON/4-13-94

HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

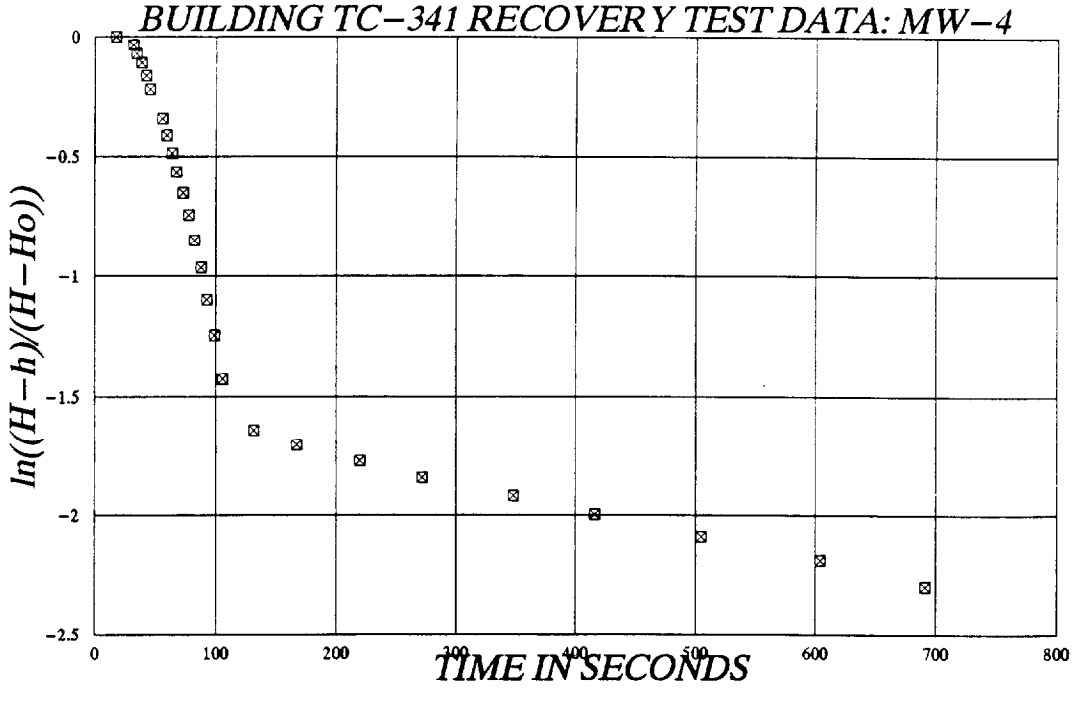
Top of screen (ft below meas. pt.)	5.0	Static Level (H) = (ft below meas. pt.)	6.97 ft	r=	0.08 ft
				R=	0.33 ft
Bot of screen (ft below meas. pt.)	15.0			L=	10 ft
		Initial Reading (Ho) = (ft below meas. pt.)	11.25 ft	H-Ho=	-4.28 ft

CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/ (H-Ho)	LN(1)	ELAPSED TIME SEC
i	11.25	3.75	-4.28	1.00	Y	X
i+1	11.25	3.75	-4.28	1.00	0.00	18
•	11.10	3.90	-4.13	0.96	-0.04	32
•	10.95	4.05	-3.98	0.93	-0.07	35
•	10.80	4.20	-3.83	0.89	-0.11	39
•	10.60	4.40	-3.63	0.85	-0.16	43
•	10.40	4.60	-3.43	0.80	-0.22	46
•	10.00	5.00	-3.03	0.71	-0.35	56
•	9.80	5.20	-2.83	0.66	-0.41	60
•	9.60	5.40	-2.63	0.61	-0.49	64
•	9.40	5.60	-2.43	0.57	-0.57	68
•	9.20	5.80	-2.23	0.52	-0.65	73
•	9.00	6.00	-2.03	0.47	-0.75	78
•	8.80	6.20	-1.83	0.43	-0.85	83
•	8.60	6.40	-1.63	0.38	-0.97	88
•	8.40	6.60	-1.43	0.33	-1.10	93
•	8.20	6.80	-1.23	0.29	-1.25	99
•	8.00	7.00	-1.03	0.24	-1.42	106
•	7.80	7.20	-0.83	0.19	-1.64	132
•	7.75	7.25	-0.78	0.18	-1.70	168
•	7.70	7.30	-0.73	0.17	-1.77	220
•	7.65	7.35	-0.68	0.16	-1.84	272
•	7.60	7.40	-0.63	0.15	-1.92	348
•	7.55	7.45	-0.58	0.14	-2.00	416
•	7.50	7.50	-0.53	0.12	-2.09	505
i+n	7.45	7.55	-0.48	0.11	-2.19	604
i+(n+1)	7.40	7.60	-0.43	0.10	-2.30	691

$K = r^2 \, LN(L(t)/R) / (2L(t)(H-h)) * d(H-h)/dt$

K (i to i+1)	0.00 f/d	0.0E+00 cm/s
	0.48 f/d	1.7E-04 cm/s
	2.29 f/d	8.1E-04 cm/s
	1.74 f/d	6.1E-04 cm/s
	2.37 f/d	8.4E-04 cm/s
	3.25 f/d	1.1E-03 cm/s
	2.05 f/d	7.2E-04 cm/s
	2.72 f/d	9.6E-04 cm/s
	2.85 f/d	1.0E-03 cm/s
	3.00 f/d	1.1E-03 cm/s
	2.55 f/d	9.0E-04 cm/s
	2.72 f/d	9.6E-04 cm/s
	2.94 f/d	1.0E-03 cm/s
	3.21 f/d	1.1E-03 cm/s
	3.56 f/d	1.3E-03 cm/s
	3.34 f/d	1.2E-03 cm/s
	3.31 f/d	1.2E-03 cm/s
	1.06 f/d	3.7E-04 cm/s
	0.22 f/d	7.7E-05 cm/s
	0.16 f/d	5.7E-05 cm/s
	0.17 f/d	6.0E-05 cm/s
	0.13 f/d	4.4E-05 cm/s
	0.15 f/d	5.3E-05 cm/s
	0.13 f/d	4.4E-05 cm/s
K (i+n to i+(n+1))	0.12 f/d	4.3E-05 cm/s
	0.16 f/d	5.5E-05 cm/s
K avg =	1.79 f/d	6.3E-04 cm/s



Spreadsheet designed by Bellis (1988).

DRAFT

SLUG/RECOVERY TEST DATA FORM

JOB NAME TC-341

JOB NO. 475-09183-01

PREPARED BY	WW	WELL IDENTITY	MW-4
DATE	2-3054	DEPTH TO TOP OF SCREEN	3.0
CHECKED BY		DEPTH TO BOT. OF SCREEN	13.0
DATE		STATIC WATER LEVEL	6.97

CLOCK TIME	ET SECONDS	ET (HMS)	ET (ACTUAL)		WATER LEVEL
9:30	18	0	:18	.30	11.25
	32	30	:32	.53	11.10
	35	1:00	:35	.58	10.95
	39	1:30	:39	.65	10.80
	43	2:00	:43	.72	10.60
	46	3:00	:46	.77	10:40
	56	4:00	:56	.93	10.00
	60	5:00	1:00	1.00	5.80
	64	10:00	1:04	1.07	5.60
	68	15:00	1:08	1.13	5.40
	73	20:00	1:13	1.22	9.20
	78	25:00	1:18	1.30	9:00
	83	30:00	1:23	1.38	8.80
	88	40:00	1:28	1.47	8.60
	93	50:00	1:33	1.55	8.40
	99	1:00:00	1:39	1.65	8.20
	106	1:10:00	1:46	1.77	8:00
	132	1:20:00	2:12	2.20	7.80
	168	1:30:00	2:48	2.80	7.75
	220	1:40:00	3:40	3.67	7.70
	272	1:50:00	4.32	4.53	7.65
	348	2:00:00	5.48	5.80	7.60
	416	2:30:00	6.56	6.93	7.55
	505	3:00:00	8.25	8.42	7.50
	604	3:30:00	10:04	10.07	7.45
9:42	691	4:00:00	11:31	11.52	7.40 EOT
		4:30:00			
		5:00:00			
		5:30:00			
		6:00:00			

4.28' diff
x .9 =
3.85
+ .43
+6.97
7.4

WATER-LEVEL METER MANUFACTURER _____

SERIAL NUMBER _____

SLUG DIMENSIONS _____

NOTES:

JOB NAME: BUILDING TC-341
JOB NO.: 475-09183-01
WELL NO.: MW-7

DRAFT

TEST BY/DATE: WILKENSON/3-30-94
ENTERED BY/DATE: BELLIS/4-13-94
CHECKED/DATE: WILKENSON/4-13-94

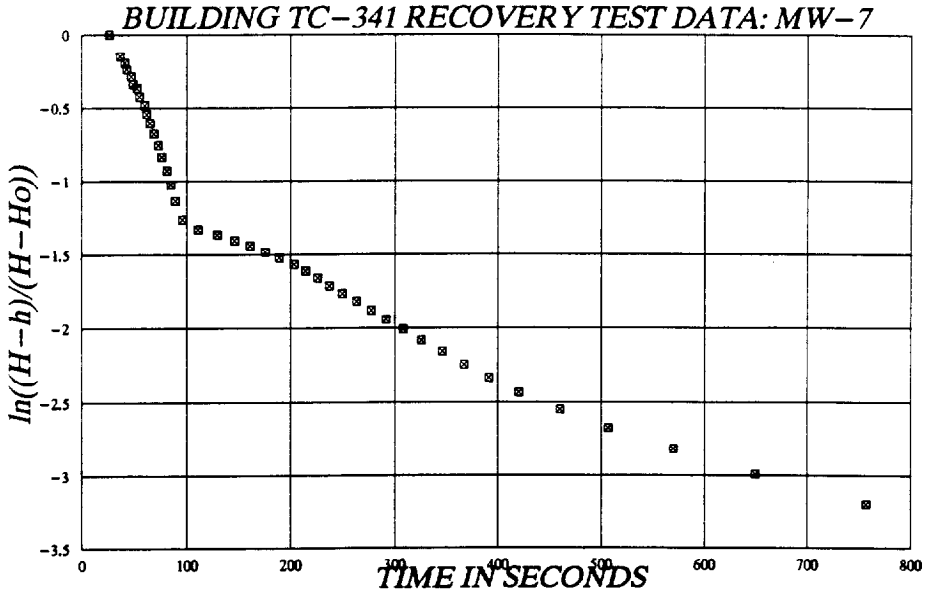
HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

Top of screen (ft below meas. pt.)	5.0	Static Level (H) = (ft below meas. pt.)	7.28 ft	r =	0.08 ft
				R =	0.33 ft
Bot of screen (ft below meas. pt.)	15.0			L =	10 ft
		Initial Reading (Ho) = (ft below meas. pt.)	12.65 ft	H-Ho =	-5.37 ft

CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/(H-Ho)	LN(1) Y	ELAPSED TIME SEC X	K=r^2 LN(L(t)/R)/(2L(t)(H-h))*d(H-h)/dt		
i	12.65	2.35	-5.37	1.00	Y	X			
i+1	12.65	2.35	-5.37	1.00	0.00	26			
	11.90	3.10	-4.62	0.86	-0.15	37	K (i to i+1)	0.00 f/d	0.0E+00 cm/s
	11.70	3.30	-4.42	0.82	-0.19	41		3.13 f/d	1.1E-03 cm/s
	11.50	3.50	-4.22	0.79	-0.24	43		2.33 f/d	8.2E-04 cm/s
	11.30	3.70	-4.02	0.75	-0.29	47		4.71 f/d	1.7E-03 cm/s
	11.10	3.90	-3.82	0.71	-0.34	49		2.39 f/d	8.4E-04 cm/s
	11.00	4.00	-3.72	0.69	-0.37	53		4.86 f/d	1.7E-03 cm/s
	10.80	4.20	-3.52	0.66	-0.42	55		1.24 f/d	4.4E-04 cm/s
	10.60	4.40	-3.32	0.62	-0.48	60		5.03 f/d	1.8E-03 cm/s
	10.40	4.60	-3.12	0.58	-0.54	62		2.07 f/d	7.3E-04 cm/s
	10.20	4.80	-2.92	0.54	-0.61	65		5.35 f/d	1.9E-03 cm/s
	10.00	5.00	-2.72	0.51	-0.68	69		3.70 f/d	1.3E-03 cm/s
	9.80	5.20	-2.52	0.47	-0.76	73		2.90 f/d	1.0E-03 cm/s
	9.60	5.40	-2.32	0.43	-0.84	76		3.04 f/d	1.1E-03 cm/s
	9.40	5.60	-2.12	0.39	-0.93	81		4.28 f/d	1.5E-03 cm/s
	9.20	5.80	-1.92	0.36	-1.03	85		2.73 f/d	9.6E-04 cm/s
	9.00	6.00	-1.72	0.32	-1.14	89		3.67 f/d	1.3E-03 cm/s
	8.80	6.20	-1.52	0.28	-1.26	96		3.98 f/d	1.4E-03 cm/s
	8.70	6.30	-1.42	0.26	-1.33	111		2.50 f/d	8.8E-04 cm/s
	8.65	6.35	-1.37	0.26	-1.37	129		0.63 f/d	2.2E-04 cm/s
	8.60	6.40	-1.32	0.25	-1.40	146		0.28 f/d	9.7E-05 cm/s
	8.55	6.45	-1.27	0.24	-1.44	161		0.30 f/d	1.1E-04 cm/s
	8.50	6.50	-1.22	0.23	-1.48	175		0.35 f/d	1.2E-04 cm/s
	8.45	6.55	-1.17	0.22	-1.52	189		0.39 f/d	1.4E-04 cm/s
	8.40	6.60	-1.12	0.21	-1.57	203		0.41 f/d	1.4E-04 cm/s
	8.35	6.65	-1.07	0.20	-1.61	214		0.42 f/d	1.5E-04 cm/s
	8.30	6.70	-1.02	0.19	-1.66	226		0.56 f/d	2.0E-04 cm/s
	8.25	6.75	-0.97	0.18	-1.71	237		0.53 f/d	1.9E-04 cm/s
	8.20	6.80	-0.92	0.17	-1.76	249		0.61 f/d	2.1E-04 cm/s
	8.15	6.85	-0.87	0.16	-1.82	263		0.58 f/d	2.1E-04 cm/s
	8.10	6.90	-0.82	0.15	-1.88	277		0.53 f/d	1.9E-04 cm/s
	8.05	6.95	-0.77	0.14	-1.94	291		0.55 f/d	2.0E-04 cm/s
	8.00	7.00	-0.72	0.13	-2.01	308		0.59 f/d	2.1E-04 cm/s
	7.95	7.05	-0.67	0.12	-2.08	326		0.51 f/d	1.8E-04 cm/s
	7.90	7.10	-0.62	0.12	-2.16	346		0.52 f/d	1.8E-04 cm/s
	7.85	7.15	-0.57	0.11	-2.24	367		0.50 f/d	1.8E-04 cm/s
	7.80	7.20	-0.52	0.10	-2.33	391		0.51 f/d	1.8E-04 cm/s
	7.75	7.25	-0.47	0.09	-2.44	420		0.49 f/d	1.7E-04 cm/s
	7.70	7.30	-0.42	0.08	-2.55	460		0.44 f/d	1.6E-04 cm/s
	7.65	7.35	-0.37	0.07	-2.68	507		0.35 f/d	1.2E-04 cm/s
	7.60	7.40	-0.32	0.06	-2.82	570		0.34 f/d	1.2E-04 cm/s
i+n	7.55	7.45	-0.27	0.05	-2.99	649		0.29 f/d	1.0E-04 cm/s
i+(n+1)	7.50	7.50	-0.22	0.04	-3.19	757	K (i+n to i+(n+1))	0.27 f/d	9.4E-05 cm/s
								0.23 f/d	8.3E-05 cm/s
							K avg =	1.68 f/d	5.9E-04 cm/s



Spreadsheet designed by Bellis (1988).

DRAFT

SLUG/RECOVERY TEST DATA FORM

JOB NAME TC-341

JOB NO. 475-09183-01

Page 1

PREPARED BY WW
DATE 3-30-94
CHECKED BY
DATE

WELL IDENTITY MW-7
DEPTH TO TOP OF SCREEN 3'
DEPTH TO BOT. OF SCREEN 13
STATIC WATER LEVEL 7.28

CLOCK TIME	ET SECONDS	ET (HMS)	ET (ACTUAL)		WATER LEVEL
10:32	26	0	.26	.43	12.65
	37	30	.37	.62	11.90
	41	1:00	.41	.68	11.70
	43	1:30	.43	.72	11.50
	47	2:00	.47	.78	11.30
	49	3:00	.49	.82	11.10
	53	4:00	.53	.88	11.00
	55	5:00	.55	.92	10.80
	60	10:00	1.00	1.00	10.60
	62	15:00	1.02	1.03	10.40
	65	20:00	1.01	1.08	10.20
	69	25:00	1:05	1.15	10.00
	73	30:00	1:13	1.27	9.80
	76	40:00	1:16	1.27	9.60
	81	50:00	1.21	1.35	9.40
	85	1:00:00	1.25	1.42	9.20
	89	1:10:00	1.29	1.48	9.00
	96	1:20:00	1.36	1.60	8.80
	111	1:30:00	1.51	1.85	8.70
	129	1:40:00	2.09	2.15	8.65
	146	1:50:00	2.26	2.43	8.60
	161	2:00:00	2.41	2.68	8.55
	175	2:30:00	2.55	2.92	8.50
	189	3:00:00	3:09	3.15	8.45
	203	3:30:00	3:23	3.38	8.40
	214	4:00:00	3.34	3.57	8.35
	226	4:30:00	3.46	3.77	8.30
	237	5:00:00	3.57	3.95	8.25
	249	5:30:00	4:05	4.15	8.20
	263	6:00:00	4:23	4.38	8.15

5.37
.9
4.837

WATER-LEVEL METER MANUFACTURER
SERIAL NUMBER
SLUG DIMENSIONS

NOTES:

DRAFT

SLUG/RECOVERY TEST DATA FORM

JOB NAME TC-341

JOB NO. 475-09183-01

Page 2

PREPARED BY WW
DATE 3-30-94
CHECKED BY
DATE

WELL IDENTITY MW-7
DEPTH TO TOP OF SCREEN 3'
DEPTH TO BOT. OF SCREEN 13'
STATIC WATER LEVEL 7.28

CLOCK TIME	ET SECONDS ET (HMS)		ET (ACTUAL)		WATER LEVEL	
	277	0	4:37	4.62	8.10	
	291	30	4:51	4.85	8.05	
	308	1:00	5:08	5.13	8:00	
	326	1:30	5:26	5.43	7.55	
	346	2:00	5:46	5.77	7.90	
	367	3:00	6:07	6.12	7.85	
	391	4:00	6:31	6.52	7.80	
	420	5:00	7:00	7.00	7.75	
	460	10:00	7:40	7.67	7.70	
	507	15:00	8:27	8.45	7.65	
	570	20:00	9:30	9.50	7.60	
	649	25:00	10:49	10.82	7.55	
10:45	757	30:00	12:37	12.62	7.50	EOT
		40:00				
		50:00				
		1:00:00				
		1:10:00				
		1:20:00				
		1:30:00				
		1:40:00				
		1:50:00				
		2:00:00				
		2:30:00				
		3:00:00				
		3:30:00				
		4:00:00				
		4:30:00				
		5:00:00				
		5:30:00				
		6:00:00				

WATER-LEVEL METER MANUFACTURER
SERIAL NUMBER
SLUG DIMENSIONS

NOTES:

JOB NAME: BUILDING TC-341
JOB NO.: 475-09183-01
WELL NO.: MW-9

DRAFT

TEST BY/DATE: WILKENSON/3-30-94
ENTERED BY/DATE: BELLIS/4-13-94
CHECKED/DATE: WILKENSON/4-13-94

HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

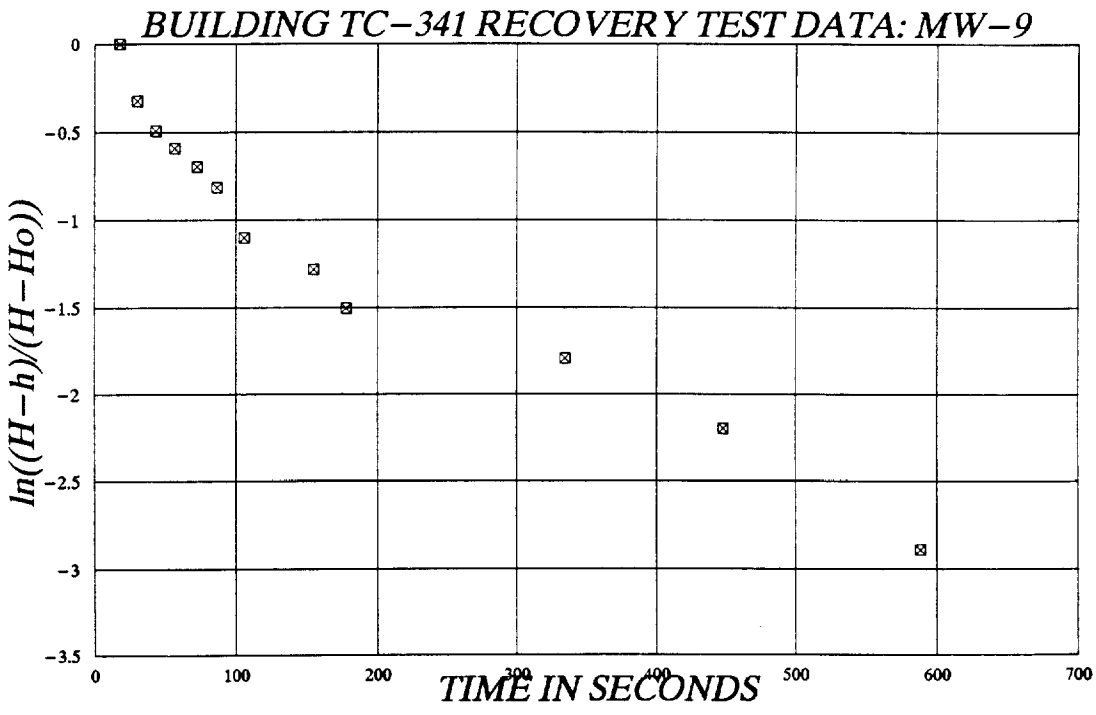
Top of screen (ft below meas. pt.)	29.0	Static Level (H) = (ft below meas. pt.)	7.32 ft	r =	0.08 ft
				R =	0.33 ft
Bot of screen (ft below meas. pt.)	34.0			L =	10 ft
		Initial Reading (Ho) = (ft below meas. pt.)	7.50 ft	H-Ho =	-0.18 ft

CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/(H-Ho)	LN(1) Y	ELAPSED TIME SEC X
i	7.50	5.00	-0.18	1.00	Y	X
i+1	7.50	5.00	-0.18	1.00	0.00	18
•	7.45	5.00	-0.13	0.72	-0.33	30
•	7.43	5.00	-0.11	0.61	-0.49	43
•	7.42	5.00	-0.10	0.56	-0.59	58
•	7.41	5.00	-0.09	0.50	-0.69	72
•	7.40	5.00	-0.08	0.44	-0.81	86
•	7.38	5.00	-0.06	0.33	-1.10	108
•	7.37	5.00	-0.05	0.28	-1.28	155
•	7.36	5.00	-0.04	0.22	-1.50	178
•	7.35	5.00	-0.03	0.17	-1.79	335
•	7.34	5.00	-0.02	0.11	-2.20	448
i+(n+1)	7.33	5.00	-0.01	0.06	-2.89	589

$K = r^2 \ln(L(t)/R)/(2L(t)(H-h))*d(H-h)/dt$

K (i to i+1)	0.00 f/d	0.0E+00 cm/s
	4.33 f/d	1.5E-03 cm/s
	2.07 f/d	7.3E-04 cm/s
	1.18 f/d	4.2E-04 cm/s
	1.06 f/d	3.7E-04 cm/s
	1.36 f/d	4.8E-04 cm/s
	2.30 f/d	8.1E-04 cm/s
	0.60 f/d	2.1E-04 cm/s
	1.56 f/d	5.5E-04 cm/s
	0.29 f/d	1.0E-04 cm/s
K (i+n to i+(n+1))	0.57 f/d	2.0E-04 cm/s
	0.76 f/d	2.7E-04 cm/s
K avg =	1.46 f/d	5.2E-04 cm/s



Spreadsheet designed by Bellis (1988).

DRAFT

SLUG/RECOVERY TEST DATA FORM

JOB NAME TC-341

JOB NO. 475-09183-01

PREPARED BY	WW	WELL IDENTITY	MW-9
DATE	3-30-94	DEPTH TO TOP OF SCREEN	25'
CHECKED BY		DEPTH TO BOT. OF SCREEN	30'
DATE		STATIC WATER LEVEL	7.32

CLOCK TIME	ET SECONDS ET (HMS)		ET (ACTUAL)		WATER LEVEL	
10:05	18	0	:18	.30	7.50	
	30	30	:30	.50	7.45	
	43	1:00	:43	.72	7.43	
	56	1:30	:56	.93	7.42	
	72	2:00	1:12	1.20	7.41	
	86	3:00	1:26	1.43	7.40	
	106	4:00	1:46	1.77	7.38	
	155	5:00	2:35	2.58	7.37	
	178	10:00	2:58	2.98	7.36	
	335	15:00	5:35	5.58	7.35	
	448	20:00	7:28	7.47	7.34	
10:15	589	25:00	9:49	9.82	7.33	EOT
		30:00				
		40:00				
		50:00				
		1:00:00				
		1:10:00				
		1:20:00				
		1:30:00				
		1:40:00				
		1:50:00				
		2:00:00				
		2:30:00				
		3:00:00				
		3:30:00				
		4:00:00				
		4:30:00				
		5:00:00				
		5:30:00				
		6:00:00				

.18
x.9
.16
7.338

WATER-LEVEL METER MANUFACTURER _____

SERIAL NUMBER _____

SLUG DIMENSIONS _____

NOTES:

JOB NAME: BUILDING TC-341
JOB NO.: 475-091 83-01
WELL NO.: MW-14

DRAFT

TEST BY/DATE: WILKENSON/3-30-84
ENTERED BY/DATE: BELLIS/4-13-84
CHECKED/DATE: WILKENSON/4-13-84

HYDRAULIC CONDUCTIVITY (K) CALCULATION FROM SLUG OR RECOVERY TEST DATA
USING HVORSLEV'S BASIC TIME-LAG METHOD
FOR WELLS SCREENED ABOVE AND BELOW THE WATER TABLE

INPUT DATA

Top of screen (ft below meas. pt.)	3.0	Static Level (H) = (ft below meas. pt.)	5.52 ft	r =	0.08 ft
				R =	0.33 ft
Bot of screen (ft below meas. pt.)	13.0			L =	10 ft
		Initial Reading (Ho) = (ft below meas. pt.)	11.60 ft	H-Ho =	-6.08 ft

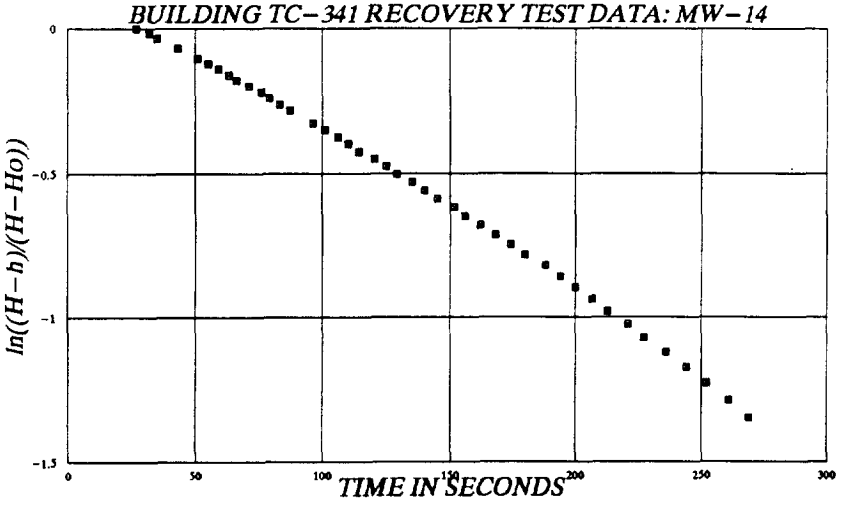
CALCULATION OF HYDRAULIC CONDUCTIVITY (K)

	WATER LEVEL FT BELOW M.P.	L(t) ft	(H-h) ft	(H-h)/(H-Ho)	LN(1)	ELAPSED TIME SEC	X
i	11.60	1.40	-6.08	1.00	Y		
i+1	11.60	1.40	-6.08	1.00	0.00		27
.	11.50	1.50	-5.98	0.98	-0.02		32
.	11.40	1.60	-5.88	0.97	-0.03		36
.	11.20	1.80	-5.68	0.93	-0.07		43
.	11.00	2.00	-5.48	0.90	-0.10		51
.	10.90	2.10	-5.38	0.88	-0.12		55
.	10.80	2.20	-5.28	0.87	-0.14		59
.	10.70	2.30	-5.18	0.85	-0.16		63
.	10.60	2.40	-5.08	0.84	-0.18		66
.	10.50	2.50	-4.98	0.82	-0.20		71
.	10.40	2.60	-4.88	0.80	-0.22		76
.	10.30	2.70	-4.78	0.79	-0.24		79
.	10.20	2.80	-4.68	0.77	-0.26		83
.	10.10	2.90	-4.58	0.75	-0.28		87
.	9.90	3.10	-4.38	0.72	-0.33		96
.	9.80	3.20	-4.28	0.70	-0.36		101
.	9.70	3.30	-4.18	0.69	-0.37		106
.	9.60	3.40	-4.08	0.67	-0.40		110
.	9.50	3.50	-3.98	0.65	-0.42		114
.	9.40	3.60	-3.88	0.64	-0.45		120
.	9.30	3.70	-3.78	0.62	-0.48		126
.	9.20	3.80	-3.68	0.61	-0.50		129
.	9.10	3.90	-3.58	0.59	-0.53		135
.	9.00	4.00	-3.48	0.57	-0.56		140
.	8.90	4.10	-3.38	0.56	-0.58		145
.	8.80	4.20	-3.28	0.54	-0.62		152
.	8.70	4.30	-3.18	0.52	-0.65		156
.	8.60	4.40	-3.08	0.51	-0.68		162
.	8.50	4.50	-2.98	0.49	-0.71		168
.	8.40	4.60	-2.88	0.47	-0.75		174
.	8.30	4.70	-2.78	0.46	-0.78		180
.	8.20	4.80	-2.68	0.44	-0.82		188
.	8.10	4.90	-2.58	0.42	-0.86		194
.	8.00	5.00	-2.48	0.41	-0.90		200
.	7.90	5.10	-2.38	0.39	-0.94		207
.	7.80	5.20	-2.28	0.37	-0.98		213
.	7.70	5.30	-2.18	0.36	-1.03		221
.	7.60	5.40	-2.08	0.34	-1.07		227
.	7.50	5.50	-1.98	0.33	-1.12		236
.	7.40	5.60	-1.88	0.31	-1.17		244
.	7.30	5.70	-1.78	0.29	-1.23		252
.	7.20	5.80	-1.68	0.28	-1.29		261
.	7.10	5.90	-1.58	0.26	-1.35		269
.	7.00	6.00	-1.48	0.24	-1.41		287
.	6.90	6.10	-1.38	0.23	-1.48		315
.	6.80	6.20	-1.28	0.21	-1.56		350
.	6.70	6.30	-1.18	0.19	-1.64		395
.	6.60	6.40	-1.08	0.18	-1.73		434
.	6.50	6.50	-0.98	0.16	-1.83		472
.	6.40	6.60	-0.88	0.14	-1.93		509
.	6.30	6.70	-0.78	0.13	-2.05		556
.	6.20	6.80	-0.68	0.11	-2.19		618
.	6.10	6.90	-0.58	0.10	-2.35		668
i+n	6.00	7.00	-0.48	0.08	-2.54		795
i+(n+1)	5.90	7.10	-0.38	0.06	-2.77		938

K=r^2 LN(L(t)/R)/(2L(t)(H-h))*d(H-h)/dt

K (i to i+1)	0.00 f/d	0.0E+00 cm/s
	1.00 f/d	3.6E-04 cm/s
	1.66 f/d	5.8E-04 cm/s
	1.23 f/d	4.4E-04 cm/s
	1.22 f/d	4.3E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	1.61 f/d	5.7E-04 cm/s
	0.96 f/d	3.4E-04 cm/s
	0.96 f/d	3.4E-04 cm/s
	1.61 f/d	5.7E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	1.08 f/d	3.8E-04 cm/s
	0.98 f/d	3.5E-04 cm/s
	0.99 f/d	3.5E-04 cm/s
	1.24 f/d	4.4E-04 cm/s
	1.25 f/d	4.4E-04 cm/s
	0.84 f/d	3.0E-04 cm/s
	1.02 f/d	3.6E-04 cm/s
	1.29 f/d	4.5E-04 cm/s
	0.87 f/d	3.1E-04 cm/s
	1.06 f/d	3.7E-04 cm/s
	1.07 f/d	3.8E-04 cm/s
	0.78 f/d	2.7E-04 cm/s
	1.38 f/d	4.9E-04 cm/s
	0.94 f/d	3.3E-04 cm/s
	0.95 f/d	3.4E-04 cm/s
	0.97 f/d	3.4E-04 cm/s
	0.99 f/d	3.5E-04 cm/s
	0.76 f/d	2.7E-04 cm/s
	1.04 f/d	3.7E-04 cm/s
	1.07 f/d	3.8E-04 cm/s
	0.94 f/d	3.3E-04 cm/s
	1.13 f/d	4.0E-04 cm/s
	0.88 f/d	3.1E-04 cm/s
	1.21 f/d	4.3E-04 cm/s
	0.84 f/d	2.9E-04 cm/s
	0.96 f/d	3.4E-04 cm/s
	1.02 f/d	3.6E-04 cm/s
	0.95 f/d	3.3E-04 cm/s
	1.12 f/d	3.9E-04 cm/s
	0.52 f/d	1.8E-04 cm/s
	0.38 f/d	1.3E-04 cm/s
	0.30 f/d	1.1E-04 cm/s
	0.25 f/d	8.9E-05 cm/s
	0.31 f/d	1.1E-04 cm/s
	0.35 f/d	1.2E-04 cm/s
	0.39 f/d	1.4E-04 cm/s
	0.34 f/d	1.2E-04 cm/s
	0.29 f/d	1.0E-04 cm/s
	0.30 f/d	1.1E-04 cm/s
K (i+n to i+(n+1))	0.23 f/d	8.1E-05 cm/s
	0.21 f/d	7.3E-05 cm/s

K avg =	0.92 f/d	3.3E-04 cm/s



Spreadsheet designed by Bellis (1986).

DRAFT

SLUG/RECOVERY TEST DATA FORM

JOB NAME TC-341

JOB NO. 475-09183-01

Page 1

PREPARED BY WW
DATE 3-30-94
CHECKED BY
DATE

WELL IDENTITY MW-14
DEPTH TO TOP OF SCREEN 3'
DEPTH TO BOT. OF SCREEN 13'
STATIC WATER LEVEL 5.52

CLOCK TIME	ET SECONDS ET (HMS)	ET (ACTUAL)		WATER LEVEL	
~~11:03~~	0	~~:30~~		~~11.60~~	
	30	~~:49~~		~~10.95~~	
	1:00	~~:59~~		~~10.45~~	
	1:30	~~:21~~		~~9.35~~	
11:07	27 2:00	:27	.45	11.60	START
	32 3:00	:32	.53	11.50	
	35 4:00	:35	.58	11.40	
	43 5:00	:43	.72	11.20	
	51 10:00	:51	.85	11.00	
	55 15:00	:55	.92	10.50	
	59 20:00	:59	.98	10.80	
	63 25:00	1:03	1.05	10.70	
	66 30:00	1:06	1.10	10.60	
	71 40:00	1:11	1.18	10.52	
	76 50:00	1:16	1.27	10.40	
	79 1:00:00	1:19	1.32	10.30	
	83 1:10:00	1:23	1.38	10:20	
	87 1:20:00	1:27	1.45	10:10	
	1:30:00	~~1:30~~		~~10.00~~	
	96 1:40:00	1:36	1.60	9.90	
	101 1:50:00	1:41	1.68	9.80	
	106 2:00:00	1:46	1.77	9.70	
	110 2:30:00	1:50	1.83	9.60	
	114 3:00:00	1.54	1.90	9:50	
	120 3:30:00	2:00	2.00	9:40	
	125 4:00:00	2:05	2.08	9.30	
	129 4:30:00	2.09	2.15	9.20	
	135 5:00:00	2:15	2.25	9.10	
	140 5:30:00	2:20	2.33	9.00	
	145 6:00:00	2:25	2.42	8.90	

6.08
.9
5.47
6.1

WATER-LEVEL METER MANUFACTURER
SERIAL NUMBER
SLUG DIMENSIONS

NOTES:

DRAFT

SLUG/RECOVERY TEST DATA FORM

Page 2

JOB NAME TC-341

JOB NO. 475-05183-01

PREPARED BY	LW	WELL IDENTITY	MW-14
DATE	3-30-94	DEPTH TO TOP OF SCREEN	3'
CHECKED BY		DEPTH TO BOT. OF SCREEN	13'
DATE		STATIC WATER LEVEL	5.52

CLOCK TIME	ET (HMS)		ET (ACTUAL)		WATER LEVEL
	152	0	2:32	2.53	8.80
	156	30	2:36	2.60	8.70
	162	1:00	2:42	2.70	8.60
	168	1:30	2:48	2.80	8.50
	174	2:00	2:54	2.90	8.40
	180	3:00	3:00	3.00	8.30
	188	4:00	3:08	3.13	8.20
	194	5:00	3:14	3.23	8.10
	200	10:00	3:20	3.03	8.00
	207	15:00	3:27	3.45	7.80
	213	20:00	3:33	3.55	7.80
	221	25:00	3:41	3.68	7.70
	227	30:00	3:47	3.78	7.60
	236	40:00	3:56	3.93	7.50
	244	50:00	4:04	4.07	7.40
	252	1:00:00	4:12	4.20	7.30
	261	1:10:00	4:21	4.35	7.20
	269	1:20:00	4:29	4.48	7.10
	287	1:30:00	4:47	4.78	7.00
	315	1:40:00	5:15	5.25	6.90
	350	1:50:00	5:50	5.83	6.80
	395	2:00:00	6:35	6.58	6.70
	434	2:30:00	7:14	7.23	6.60
	472	3:00:00	7:52	7.87	6.50
	509	3:30:00	8:29	8.48	6.40
	556	4:00:00	9:16	9.27	6.30
	618	4:30:00	10:18	10.30	6.20
	688	5:00:00	11:28	11.47	6.10
	795	5:30:00	13:15	13.25	6.00
11:23	939	6:00:00	15:39	15.65	5.90 EOT

WATER-LEVEL METER MANUFACTURER

SERIAL NUMBER

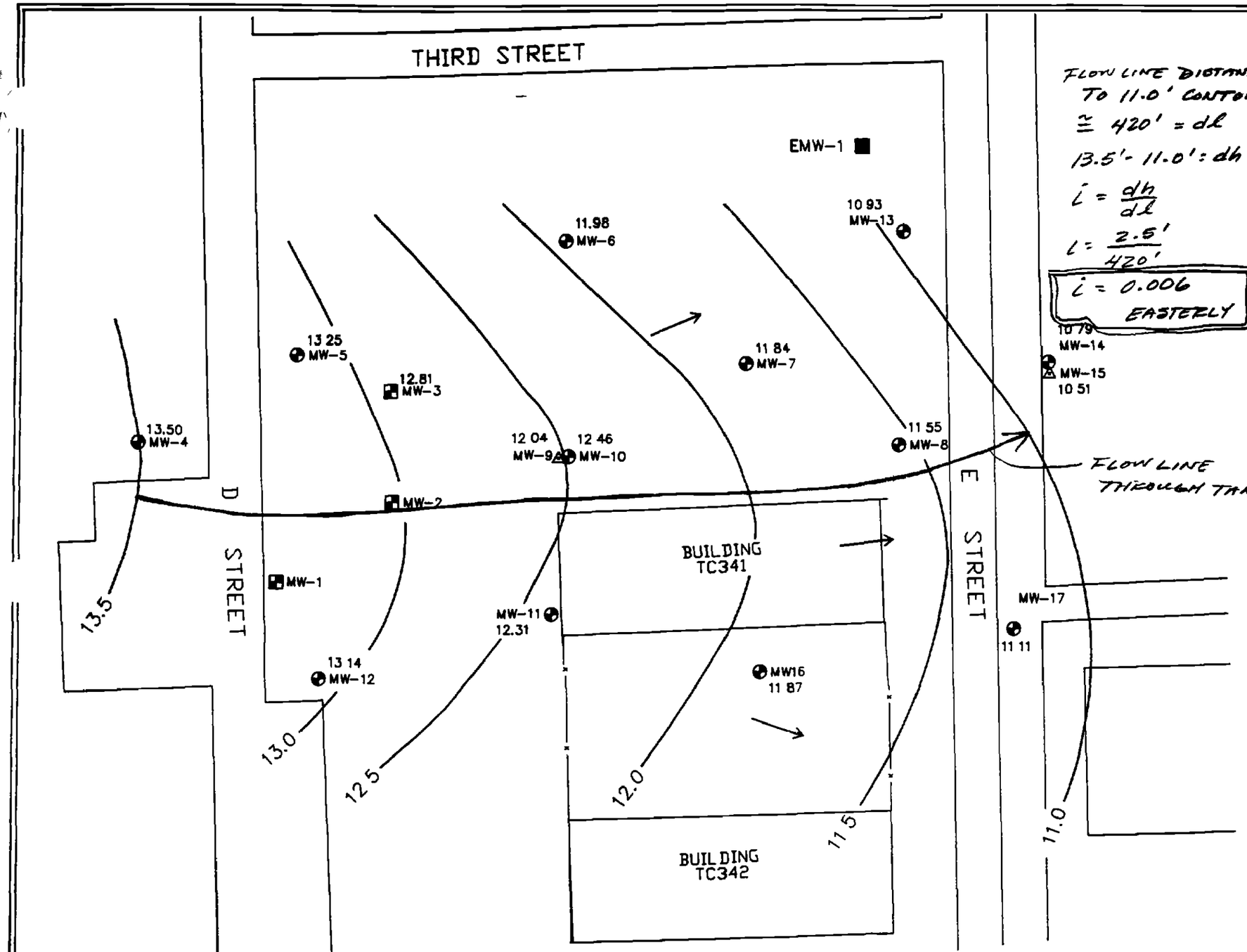
SLUG DIMENSIONS

NOTES:

DRAFT

APPENDIX G

RECOVERY TEST DATA AND HYDRAULIC CONDUCTIVITY CALCULATIONS



FLOW LINE DISTANCE FROM 13.5' CONTOUR
TO 11.0' CONTOUR
$\cong$ 420' = dl

13.5' - 11.0' : dh = 2.5'

$i = \frac{dh}{dl}$

$i = \frac{2.5'}{420'}$

$i = 0.006$
EASTERLY

NORTH

NO

1.
2.
3.
4.
5.

Add note @ Bottom of legend (move Bar Scale) that reads:

NOTE: NUMBERS BESIDE WELLS ARE ~~GROUND~~ WATER ~~TABLE~~ ELEVATIONS MEASURED ON 3/30/94. FREE PRODUCT WAS DETECTED IN WELLS MW-2 and MW-1 THEREFORE WATER TABLE ELEVATIONS ARE NOT SHOWN FOR THESE WELLS

IONUMENT
T.
AKEN

TS

RKING AREA
P AUTOCAD.DWG
THERWISE

NLY
Y. ALL OTHER
ERENCED
CTLY

LEGEND

- MW-1 LOCATION OF LAW ENGINEERING TYPE II MONITORING WELL (MARCH 1994)
- MW-9 LOCATION OF LAW ENGINEERING TYPE III MONITORING WELL (MARCH 1994)
- MW-3 LOCATION OF ATEC WELL
- EMW-1 LOCATION OF PRE-EXISTING MONITORING WELL
- DIRECTION OF SHALLOW GROUNDWATER FLOW
- CHAIN LINK FENCE
- WATER TABLE ELEVATION CONTOUR (3-30-94)

GRAPHIC SCALE - IN FEET
50 25 0 50 100

DRAFT

J9183J05

LAW ENGINEERING
RALEIGH, NORTH CAROLINA

WATER TABLE CONTOUR MAP
HEATING PLANT BUILDING, TC341
CAMP LEJEUNE, NORTH CAROLINA
CONTRACT N62470-93-D-4020

DRAWN:	DATE: APRIL 1994
DFT CHECK:	SCALE: 1"=50'
ENG CHECK:	JOB: 475-09183-01
APPROVAL:	DWG. 5.1

REFERENCE McKIM & CREED DWG NO S.1.1.2.037

1987E17Z

DRAFT

APPENDIX H

MONITORING WELL AND SAMPLING FIELD DATA WORKSHEETS

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-1

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1255

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 65° Sunny

TOTAL WELL DEPTH (TWD) 19.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.8 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 7.8 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = _____ 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X _____ 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = _____ 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER: _____

TOTAL VOLUME OF WATER REMOVED _____ 1/10 GAL. CASING DIAMETER 4 In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) N/A (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES X	NO _____	COMMENTS _____
LOCKING CAP	YES X	NO _____	No purging due to free product in MW.
PROTECTIVE POST/ABUTMENT	YES X	NO _____	No I.D. Plate, label.
NONPOTABLE LABEL	YES _____	NO X	Depth to FP: 7.65'
ID PLATE	YES _____	NO X	_____
WELL INTEGRITY SATISFACTORY	YES X	NO _____	_____

WELL YIELD LOW _____ MODERATE _____ HIGH _____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-2

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1330

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 70° Sunny

TOTAL WELL DEPTH (TWD) 20.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 3.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 10.1 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = _____ 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X _____ 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = _____ 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER: _____

TOTAL VOLUME OF WATER REMOVED _____ 1/10 GAL. CASING DIAMETER 4 In.

CASING MATERIAL PVC X S.S. _____ TEFLON _____ OTHER _____

SCREENED INTERVAL (FROM ID PLATE) N/A (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES X	NO _____	COMMENTS _____
LOCKING CAP	YES _____	NO X	No purging due to free product in MW.
PROTECTIVE POST/ABUTMENT	YES X	NO _____	No lockable cap, I.D. Plate or non-potable label.
NONPOTABLE LABEL	YES _____	NO X	Depth to FP: 8.02'
ID PLATE	YES _____	NO X	_____
WELL INTEGRITY SATISFACTORY	YES X	NO _____	_____

WELL YIELD LOW _____ MODERATE _____ HIGH _____ COMMENTS _____

FIELD ANALYSES

VOLUME (1/10 GAL.)				
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*				

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-3

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1540

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 70° Sunny

TOTAL WELL DEPTH (TWD) 19.5 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.6 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 7.44 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 14.66 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 9.7 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 29.1 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 29.1 1/10 GAL. CASING DIAMETER 4 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) N/A (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING	YES X	NO	COMMENTS
LOCKING CAP	YES	NO X	
PROTECTIVE POST/ABUTMENT	YES X	NO	
NONPOTABLE LABEL	YES	NO X	
ID PLATE	YES	NO X	
WELL INTEGRITY SATISFACTORY	YES X	NO	
WELL YIELD	LOW	MODERATE X	HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	14.6	29.1	
pH (S.U.)	6.36	6.49	6.46	
SP. COND. (μMHOS/CM)	250	240	230	
WATER TEMP. (°C)	15.0	13.8	14.2	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-4

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1640

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 65° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.1 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.85 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.25 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' -13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	6.41	6.50	6.43	
SP. COND. (μMHOS/CM)	125	120	100	
WATER TEMP. (°C)	15.5	14.6	14.2	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-5

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1135

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 65° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.38 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.62 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.5 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.5 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

OTAL VOLUME OF WATER REMOVED 4.5 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' -13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.3	4.5	
pH (S.U.)	6.05	5.83	5.76	
SP. COND. (μMHOS/CM)	60	65	65	
WATER TEMP. (°C)	14.3	14.0	14.2	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-6

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1015

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 7.13 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 7.87 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.3 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 3.9 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 3.9 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' -13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.0	3.9	
pH (S.U.)	4.95	4.80	4.73	
SP. COND. (μMHOS/CM)	80	70	65	
WATER TEMP. (°C)	14.3	13.6	13.3	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-7

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/16/94 TIME (MILITARY) 1330

FIELD PERSONNEL Wilkinson

WEATHER CONDITIONS 70° Partly Cloudy

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.6 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.4 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X .17 = 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.3 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.3 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.2	4.3	
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-8

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1715

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 70° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 4.94 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.06 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

OTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' -13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES NO X

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	5.32	5.45	5.18	
SP. COND. (μMHOS/CM)	110	110	110	
WATER TEMP. (°C)	14.6	14.3	13.7	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-9

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1050

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 30.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.1 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 7.29 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 24.81 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 4.2 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 12.6 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

OTAL VOLUME OF WATER REMOVED 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 25.0' - 30.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES NO X No lockable cap.

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE HIGH X COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	6.3	12.6	
pH (S.U.)	6.48	7.24	7.86	
SP. COND. (μMHOS/CM)	480	490	470	
WATER TEMP. (°C)	18.2	19.0	18.9	
TURBIDITY*	3	3	3	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-10

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/16/94 TIME (MILITARY) 1430

FIELD PERSONNEL Wilkinson

WEATHER CONDITIONS 70° Partly Cloudy

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 5.0 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 9.0 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X .17 = 1.5 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.6 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.6 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW X MODERATE HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.3	4.6	
pH (S.U.)				
SP. COND. (μMHOS/CM)				
WATER TEMP. (°C)				
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-11

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1115

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 65° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 1.9 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.90 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.0 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	6.32	5.96	5.86	
SP. COND. (μMHOS/CM)	95	85	80	
WATER TEMP. (°C)	16.4	15.4	15.0	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

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RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-12

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 1655

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 70° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.56 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.44 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	6.44	6.91	7.09	
SP. COND. (μMHOS/CM)	330	340	335	
WATER TEMP. (°C)	15.9	15.6	15.9	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-13

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 0940

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 2.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 6.72 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.28 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES X NO

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	5.73	5.61	5.47	
SP. COND. (μMHOS/CM)	55	50	50	
WATER TEMP. (°C)	13.9	13.5	13.1	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

DRAFT

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-14

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 0825

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 5.44 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 7.56 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.3 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 3.9 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 3.0 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES NO X

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO Dry at 3.0 gallon

WELL YIELD LOW X MODERATE HIGH COMMENTS Strong Petroleum Odor

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.0	3.0	
pH (S.U.)	5.95	6.29	6.21	
SP. COND. MHOS/CM)	360	355	360	
WATER TEMP. (C)	15.0	14.6	14.7	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-15

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 0845

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 30.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 5.60 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 24.4 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 4.1 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 12.3 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 12.3 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 25.0' - 30.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES NO X

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE HIGH X COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	6.2	12.3	
pH (S.U.)	6.61	7.24	7.50	
SP. COND. (μMHOS/CM)	600	550	600	
WATER TEMP. (°C)	17.5	17.6	18.3	
TURBIDITY*	3	3	3	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

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MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-16

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 0750

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 4.65 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 8.35 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

TOTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES NO X

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	5.14	5.03	5.01	
SP. COND. (μMHOS/CM)	100	95	95	
WATER TEMP. (°C)	14.3	13.7	13.9	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

LAW ENGINEERING
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA 27604

MONITORING WELL SAMPLING AND FIELD DATA WORKSHEET

LAW JOB NUMBER 475-09183-01 MONITORING WELL NUMBER MW-17

SITE NAME TC-341 (Camp Geiger)

DATE (MO/DAY/YR) 03/22/94 TIME (MILITARY) 0915

FIELD PERSONNEL Fischer/Whalen

WEATHER CONDITIONS 60° Sunny

TOTAL WELL DEPTH (TWD) 13.0 1/10 FT. (DEPTH BELOW MEASURING POINT)

HEIGHT OF MEASURING POINT ABOVE LAND SURFACE 0.0 1/10 FT.

DESCRIPTION OF MEASURING POINT Top of Marked Casing

DEPTH TO GROUNDWATER (DGW) 5.02 1/100 FT. (DEPTH BELOW MEASURING POINT)

LENGTH OF WATER COLUMN (LWC) = TWD - DGW = 7.98 1/100 FT.

ONE STANDING WELL VOLUME (SWV) = LWC X 1.4 1/10 GAL.

THREE STANDING WELL VOLUMES = 3XSWV = 4.2 1/10 GAL = STANDARD EVACUATION VOLUME

METHOD OF WELL EVACUATION TEFLON BAILER X OTHER:

OTAL VOLUME OF WATER REMOVED 4.2 1/10 GAL. CASING DIAMETER 2 In.

CASING MATERIAL PVC X S.S. TEFLON OTHER

SCREENED INTERVAL (FROM ID PLATE) 3.0' - 13.0' (DEPTHS BELOW LAND SURFACE - FT.)

STEEL GUARD PIPE AROUND CASING YES X NO COMMENTS

LOCKING CAP YES X NO

PROTECTIVE POST/ABUTMENT YES NO X

NONPOTABLE LABEL YES X NO

ID PLATE YES X NO

WELL INTEGRITY SATISFACTORY YES X NO

WELL YIELD LOW MODERATE X HIGH COMMENTS

FIELD ANALYSES

VOLUME (1/10 GAL.)	0.0	2.1	4.2	
pH (S.U.)	5.62	5.22	4.98	
SP. COND. (μMHOS/CM)	180	175	165	
WATER TEMP. (°C)	15.4	14.7	14.5	
TURBIDITY*	4	4	4	

*VISUAL DETERMINATION ONLY
(1) CLEAR (2) SLIGHT (3) MODERATE (4) HIGH

DRAFT

APPENDIX I

LABORATORY ANALYTICAL TEST REPORTS
CHAIN OF CUSTODY RECORDS

GeoChem Incorporated

DRAFT

Environmental Laboratories

RECEIVED BY
MAR 14 1994
LAW ENGINEERING
RALEIGH

March 7, 1994

Mr. Brian Bellis
Law Engineering
P.O. Box 18288
Raleigh, NC 27619

Reference: **TC-341 (weekly summary 02/27/94-03/05/94)**
475-09183-01
GCI# 9403-002M

Dear Mr. Brian Bellis:

This is the analytical report for the above referenced project. On February 3, 1994 we received twelve soil samples for analysis. The analytical and quality control results are presented in separate tables for your convenience. Brief summaries of analytical methods employed are as follows. GeoChem analytical reports contain information based strictly on the analysis requested on the chain of custody (COC) accompanying this report. Non-target compounds are not identified or quantified.

TPH

Samples are analyzed by following the California U.S.T. manual. This methodology incorporates EPA purge and trap (meth. 5030) techniques for analysis of volatile fuels such as gasoline. Less volatile fuels such as diesel fuel and kerosene must be extracted using solvents prior to analysis (soils are sonicated, meth. 3550). A standard calibration curve is created from the pure fuel of interest. The standards serve two functions; they create a "finger print" pattern for comparisons and they allow the chemist to calculate the concentration of that fuel analyzed for.

If there are any technical questions please feel free to call me at 919-460-8093. Thank you for allowing GEOCHEM to serve your analytical needs.

Sincerely,

Dean Gokel
President

2500 Gate Way Centre Blvd., Suite 300 • Morrisville, NC 27560
Telephone: 919-460-8093 • FAX: 919-460-0167

Project# mobile summary 1 Site Name TC-341

LAB ID.	0229	0230	0231
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE ANALYZED	03/03/94	03/03/94	03/03/94
FIELD ID.	0.0-1.5(MW-8)	3.5-5.0(MW-8)	0.0-1.5(MW-7)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/gas	BDL	1.0	BDL	1.0	BDL	1.0

LAB ID.	0232	0233	0234
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE ANALYZED	03/03/94	03/03/94	03/03/94
FIELD ID.	3.5-5.0(MW-7)	0.0-1.5(MW-4)	3.5-5.0(MW-4)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/gas	BDL	1.0	BDL	1.0	BDL	1.0

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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GeoChem Incorporated DRAFT

Environmental Laboratories

Project# mobile summary 2 Site Name TC-341

LAB ID.	0235	0236	0237
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE ANALYZED	03/03/94	03/03/94	03/03/94
FIELD ID.	0.0-1.5(MW-5)	3.5-5.0(MW-5)	0.0-1.5(MW-6)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/gas	BDL	1.0	BDL	1.0	BDL	1.0

LAB ID.	0238	0239	0240
DATE SAMPLED	03/01/94	03/03/94	03/03/94
DATE ANALYZED	03/03/94	03/03/94	03/03/94
FIELD ID.	3.5-5.0(MW-6)	0.0-1.5(MW-9)	3.5-5.0(MW-9)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/gas	BDL	1.0	BDL	1.0	BDL	1.0

	soil	water
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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Project# mobile summary 3 Site Name TC-341

LAB ID.	0229	0230	0231
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE EXTRACTED	03/03/94	03/03/94	03/03/94
FIELD ID.	0.0-1.5(MW-8)	3.5-5.0(MW-8)	0.0-1.5(MW-7)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/diesel	BDL	5.0	BDL	5.0	BDL	5.0

LAB ID.	0232	0233	0234
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE EXTRACTED	03/03/94	03/03/94	03/03/94
FIELD ID.	3.5-5.0(MW-7)	0.0-1.5(MW-4)	3.5-5.0(MW-4)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/diesel	BDL	5.0	BDL	5.0	BDL	5.0

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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Environmental Laboratories

Project# mobile summary 4 Site Name TC-341

LAB ID.	0235	0236	0237
DATE SAMPLED	03/01/94	03/01/94	03/01/94
DATE EXTRACTED	03/03/94	03/03/94	03/03/94
FIELD ID.	0.0-1.5(MW-5)	3.5-5.0(MW-5)	0.0-1.5(MW-6)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/diesel	BDL	5.0	BDL	5.0	BDL	5.0

LAB ID.	0238	0239	0240
DATE SAMPLED	03/01/94	03/03/94	03/03/94
DATE EXTRACTED	03/03/94	03/03/94	03/03/94
FIELD ID.	3.5-5.0(MW-6)	0.0-1.5(MW-9)	3.5-5.0(MW-9)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/diesel	BDL	5.0	BDL	5.0	BDL	5.0

	soil	*water*
parts per million	*mg/kg*	*mg/l*
parts per billion	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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Telephone: 919-460-8093 • FAX: 919-460-0167

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Environmental Laboratories

QUALITY CONTROL RESULTS

METHOD	RECOVERY	METHOD DETECTION LIMIT
TPH/gas	106 %	1.0 ppm
TPH/diesel	81 %	5.0 ppm

REVIEWED BY

Laura Fogleman

REVIEWED BY

Valeri G. Rose

2500 Gate Way Centre Blvd., Suite 300 • Morrisville, NC 27560
Telephone: 919.460.9909 • FAX: 919.460.0167

Report To: BRIAN BELLS

Bill To:

GeoChem, Incorporated

Environmental Laboratories

2500 Gate Way Centre Blvd., Suite 300
Morrisville, NC 27560

Chain of Custody Record

PROJECT SITE NUMBER: 475-09183-01
PO#:
SITE NAME: TC-341
COLLECTED BY (Signature): Shayne J Stickinson
GEOCHEM PROJECT #: 9403-002M
DATE DUE: ASAP
VERBAL/FAX/HARDCOPY

FIELD SAMPLE ID	TURNAROUND IN DAYS	SAMPLE MATRIX	DATE AND TIME COLLECTED	NO. OF CONTAINERS PER LOCATION	TPH 3550/3630	REMARKS	LAB ID NO. (for lab use only)
0.0-1.5 MW-8	1-3	Soil	3-1-94 3:25	1	X		229
3.5-5.0 MW-8	"	"	3-1-94 3:32	1	X		230
0.0-1.5 MW-7	"	"	3-1-94 1:42	1	X		231
3.5-5.0 MW-7	"	"	3-1-94 1:49	1	X		232
0.0-1.5 MW-4	"	"	3-1-94 8:27	1	X		233
3.5-5.0 MW-4	"	"	3-1-94 8:32	1	X		234
0.0-1.5 MW-5	"	"	3-1-94 10:25	1	X		235
3.5-5.0 MW-5	"	"	3-1-94 10:30	1	X		236
0.0-1.5 MW-6	"	"	3-1-94 12:50	1	X		237
3.5-5.0 MW-6	"	"	3-1-94 12:58	1	X		238
0.0-1.5 MW-9	"	"	3-3-94 8:55	1	X		239
3.5-5.0 MW-9	"	"	3-3-94 9:08	1	X		240

REMARKS

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Russell Upchurch	3/3/94	1:45pm			

RELINQUISHED BY:	DATE	TIME
Shayne J Stickinson	3-3-94	1:40pm

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

This Chain of Custody is considered a written contract to perform the services requested in the analyses section of this document.

GeoChem DRAFT Incorporated

Environmental Laboratories

March 15, 1994

Mr. Brian Bellis
Law Engineering
P.O. 18288
Raleigh, NC 27619

Reference: **TC 341 (weekly summary 03/06/94-03/12/94)**
475-09183-01
GCI# 9403-003M

Dear Mr. Brian Bellis:

This is the analytical report for the above referenced project. On March 3, 1994 we received three soil samples for analysis. The analytical and quality control results are presented in separate tables for your convenience. Brief summaries of analytical methods employed are as follows. GeoChem analytical reports contain information based strictly on the analysis requested on the chain of custody (COC) accompanying this report. Non-target compounds are not identified or quantified.

TPH

Samples are analyzed by following the California U.S.T. manual. This methodology incorporates EPA purge and trap (meth. 5030) techniques for analysis of volatile fuels such as gasoline. Less volatile fuels such as diesel fuel and kerosene must be extracted using solvents prior to analysis (soils are sonicated, meth. 3550). A standard calibration curve is created from the pure fuel of interest. The standards serve two functions; they create a "finger print" pattern for comparisons and they allow the chemist to calculate the concentration of that fuel analyzed for.

If there are any technical questions please feel free to call me at 919-460-8093. Thank you for allowing GEOCHEM to serve your analytical needs.

Sincerely,

Dean Gokel
President

2500 Gate Way Centre Blvd., Suite 300 • Morrisville, NC 27560
Telephone: 919-460-8093 • FAX: 919-460-0167

GeoChem, Incorporated

DRAFT

Environmental Laboratories

Project mobile summary 1 **Site Name TC 341**

LAB ID.	0241	0242	0243
DATE SAMPLED	03/03/94	03/03/94	03/03/94
DATE ANALYZED	03/04/94	03/04/94	03/04/94
FIELD ID.	MW-10(0.0-1.5)	Dup	MW-10(3.5-5.0)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/gas	BDL	1.0	BDL	1.0	BDL	1.0

LAB ID.	0241	0242	0243
DATE SAMPLED	03/03/94	03/03/94	03/03/94
DATE EXTRACTED	03/03/94	03/03/94	03/03/94
FIELD ID.	MW-10(0.0-1.5)	Dup	MW-10(3.5-5.0)

METHOD

ANALYTE	mg/kg	pql	mg/kg	pql	mg/kg	pql
TPH/diesel	BDL	5.0	BDL	5.0	100	5.0

	soil	*water*
parts per million	*mg/kg*	*mg/l*
parts per billion	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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Telephone: 919-460-9093 • FAX: 919-460-0167

QUALITY CONTROL RESULTS

METHOD	RECOVERY	METHOD DETECTION LIMIT
TPH/gas	80 %	1.0 ppm
TPH/diesel	81 %	5.0 ppm

REVIEWED BY

Laura Foglesong

REVIEWED BY

Valeri G. Reese

Report To: Brian Bellis

Bill To:

GeoChem, Incorporated

Environmental Laboratories

2500 Gate Way Centre Blvd., Suite 300
Morrisville, NC 27560

Chain of Custody Record

PROJECT SITE NUMBER: 475-09183-01 | PO#:
SITE NAME: TC 3491
COLLECTED BY (Signature): Wayne V. Wilkinson
GEOCHEM PROJECT #: 9403-003m
DATE DUE: ASAP
VERBAL/FAX/HARDCOPY

FIELD SAMPLE ID	TURNAROUND IN DAYS	SAMPLE MATRIX	DATE AND TIME COLLECTED	NO. OF CONTAINERS PER LOCATION	TPH 8150/5030	REMARKS	LAB ID NO. (for lab use only)
MW-10 0.0-1.5	1-3	Soil	3:20 3-3-94	1	X		242
Dup	1-3	Soil	3-3-94	1	X		242
MW-10 3.5-5.0	1-3	Soil	3-2&-94 3-3-94	1	X		243

REMARKS

RELINQUISHED BY:	DATE	TIME
Wayne V. Wilkinson	3-3-94	16:40

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Russell Yahner	3/3/94	4:40									

This Chain of Custody is considered a written contract to perform the services requested in the analyses section of this document.

GeoChem Incorporated DRAFT

Environmental Laboratories

March 22, 1994

Mr. Brian Bellis
Law Engineering
P.O. Box 18288
Raleigh, NC 27619

Reference: **TC-341 (weekly summary 03/13/94-03/19/94)**
475-09183-01
GCI# 9403-014M

Dear Mr. Brian Bellis:

This is the analytical report for the above referenced project. On March 16, 1994 we received three water samples for analysis. The analytical and quality control results are presented in separate tables for your convenience. Brief summaries of analytical methods employed are as follows. GeoChem analytical reports contain information based strictly on the analysis requested on the chain of custody (COC) accompanying this report. Non-target compounds are not identified or quantified.

EPA method 602

Samples are loaded into a specially designed purging chamber at ambient temperature. Helium is bubbled through the sample. This drives the organics onto a sorbent trap. Once purging has been completed the sorbent column is rapidly heated. This efficiently transfers the organics into the gas chromatograph which separates the components of the sample. The purgeable organics are then detected using flame ionization and photo ionization detectors.

2500 Gate Way Centre Blvd., Suite 300 • Morrisville, NC 27560
Telephone: 919-460-8083 • FAX: 919-460-0167

PAH (EPA Method 610)

This method covers the determination of certain polynuclear aromatic hydrocarbons (PAH). A measured volume of sample, approximately one liter, is extracted with methylene chloride using a separatory funnel or a continuous liquid to liquid extractor. The methylene chloride extract is then analyzed by gas chromatography using a flame ionization detector for compound identification.

If there are any technical questions please feel free to call me at 919-460-8093. Thank you for allowing GEOCHEM to serve your analytical needs.

Sincerely,

Dean Gokel
President

Project mobile summary 1 Site Name TC-341

LAB ID.	0267	0268	0269
DATE SAMPLED	03/16/94	03/16/94	03/16/94
DATE ANALYZED	03/16/94	03/16/94	03/17/94
FIELD ID.	MW-7	MW-4	MW-10

METHOD

ANALYTE	ug/l	pql	ug/l	pql	ug/l	pql
EPA 602						
Benzene	0.6	0.5	BDL	0.5	BQL	1.0
Toluene	BDL		0.7		BQL	
Chlorobenzene	BDL		BDL		BQL	
Ethylbenzene	BDL		BDL		BQL	
Xylenes	BDL		BDL		1.6	
1,3 Dichlorobenzene	BDL		BDL		BQL	
1,4 Dichlorobenzene	BDL		BDL		BQL	
1,2 Dichlorobenzene	BDL		BDL		BQL	

	soil	*water*
parts per million	*mg/kg*	*mg/l*
parts per billion	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

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Project mobile summary 2 Site Name TC-341

LAB ID.	0267	0268	0269
DATE SAMPLED	03/16/94	03/16/94	03/16/94
DATE EXTRACTED	03/16/94	03/16/94	03/16/94
FIELD ID.	MW-7	MW-4	MW-10

METHOD ANALYTE 610	ug/l	pql	ug/l	pql	ug/l	pql
Naphthalene	BQL	0.5	BDL	0.5	32.6	0.5
Acenaphthylene	BQL	0.5	BDL	0.5	BQL	0.5
Acenaphthene	BQL	0.5	BDL	0.5	19.3	0.5
Fluorene	BQL	0.5	BDL	0.5	BQL	0.5
Phenanthrene	BQL	0.5	BDL	0.5	8.9	0.5
Anthracene	BQL	0.5	BDL	0.5	2.1	0.5
Fluoranthene	BQL	0.5	BDL	0.5	BQL	0.5
Pyrene	BQL	0.5	BDL	0.5	BQL	0.5
Benzo(a)anthracene	BQL	1.1	BDL	1.0	BQL	1.1
Chrysene	BQL	0.5	BDL	0.5	BQL	0.5
Benzofluoranthenes	BQL	2.1	BDL	2.0	BQL	2.2
Benzo(a)pyrene	BQL	2.1	BDL	2.0	BQL	2.2
Indeno(1,2,3-cd)pyrene	BQL	2.7	BDL	2.5	BQL	2.7
Dibenzo(a,h)anthracene	BQL	2.7	BDL	2.5	BQL	2.7
Benzo(g,h,i)perylene	BQL	2.7	BDL	2.5	BQL	2.7

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bql = below quantitation limit.
bdl = below method detection limit

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QUALITY CONTROL RESULTS

METHOD	RECOVERY	METHOD DETECTION LIMIT
602		
Benzene	104 %	0.5 ppb
Toluene	97 %	
Chlorobenzene	96 %	
Ethylbenzene	100 %	
Xylenes	98 %	
1,3-Dichlorobenzene	94 %	
1,2-Dichlorobenzene	87 %	
1,4-Dichlorobenzene	96 %	
610		
Naphthalene	96 %	0.5 ppb
Acenaphthene	103 %	
Phenanthrene	108 %	

REVIEWED BY

Laura Fogleman

REVIEWED BY

Valeri G. Rees

Report To: BRIAN BOLLIS

Bill To:

GeoChem, Incorporated

Environmental Laboratories

2500 Gate Way Centre Blvd., Suite 300
Morrisville, NC 27560

Chain of Custody Record

PROJECT SITE NUMBER: 475-09183-01 | PO#:
SITE NAME: TC-341
COLLECTED BY (Signature): Wayne J. Hutchinson
GEOCHEM PROJECT #: 9403-014M
DATE DUE: ASAP
VERBAL/FAX/HARDCOPY:

FIELD SAMPLE ID	TURNAROUND IN DAYS	SAMPLE MATRIX	DATE AND TIME COLLECTED	NO. OF CONTAINERS PER LOCATION	ANALYSES: 602	ANALYSES: 610	REMARKS	LAB ID (for lab use only)
MW-7	1-3	WATER	1:30 3-16-94	3	2 X	1 X		267
MW-4	1-3	"	2:00 3-16-94	3	2 X	1 X		268
MW-10	1-3	"	2:30 3-16-94	3	2 X	1 X		269

REMARKS

RELINQUISHED BY: Wayne J. Hutchinson / Walter V. Wilkinson — DATE: 3-16 — TIME: 2:45

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Tony C Copeland	3/16/94	2:45pm									

Tony C Copeland

This Chain of Custody is considered a written contract to perform the services requested in the analyses section of this document.

GeoChem Incorporated DRAFT

Environmental Laboratories

March 29, 1994

Mr. Brian Bellis
Law Engineering
P.O. Box 18288
Raleigh, NC 27619

Reference: **TC-341 (weekly summary 03/20/94-03/26/94)**
475-09183-01
GCI# 9403-020M

Dear Mr. Brian Bellis:

This is the analytical report for the above referenced project. On March 23, 1994 we received nine groundwater samples for analysis. The analytical and quality control results are presented in separate tables for your convenience. Brief summaries of analytical methods employed are as follows. GeoChem analytical reports contain information based strictly on the analysis requested on the chain of custody (COC) accompanying this report. Non-target compounds are not identified or quantified.

PAH (EPA Method 610)

This method covers the determination of certain polynuclear aromatic hydrocarbons (PAH). A measured volume of sample, approximately one liter, is extracted with methylene chloride using a separatory funnel or a continuous liquid to liquid extractor. The methylene chloride extract is then analyzed by gas chromatography using a flame ionization detector for compound identification.

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EPA method 602

Samples are loaded into a specially designed purging chamber at ambient temperature. Helium is bubbled through the sample. This drives the organics onto a sorbent trap. Once purging has been completed the sorbent column is rapidly heated. This efficiently transfers the organics into the gas chromatograph which separates the components of the sample. The purgeable organics are then detected using flame ionization and photo ionization detectors.

If there are any technical questions please feel free to call me at 919-460-8093. Thank you for allowing GEOCHEM to serve your analytical needs.

Sincerely,

Dean Gokel
President

Project mobile summary 1 Site Name TC-341

LAB ID.	0281		0282		0283	
DATE SAMPLED	03/22/94		03/22/94		03/22/94	
DATE EXTRACTED	03/23/94		03/23/94		03/23/94	
FIELD ID.	TC341MW1		TC341MW2		TC341MW3	
METHOD						
ANALYTE	ug/l	pql	ug/l	pql	ug/l	pql
610						
Naphthalene	214	4.5	457	4.5	BDL	0.5
Acenaphthylene	BQL	4.5	BQL	4.5	BDL	0.5
Acenaphthene	247	4.5	108	4.5	BDL	0.5
Fluorene	326	4.5	166	4.5	BDL	0.5
Phenanthrene	BQL	4.5	BQL	4.5	BDL	0.5
Anthracene	114	4.5	BQL	4.5	BDL	0.5
Fluoranthene	45.5	4.5	12.2	4.5	BDL	0.5
Pyrene	133	4.5	136	4.5	BDL	0.5
Benzo(a)anthracene	BQL	9.0	BQL	9.0	BDL	1.0
Chrysene	BQL	4.5	BQL	4.5	BDL	0.5
Benzofluoranthenes	BQL	18.0	BQL	18.0	BDL	2.0
Benzo(a)pyrene	BQL	18.0	BQL	18.0	BDL	2.0
Indeno(1,2,3-cd)pyrene	BQL	22.5	BQL	22.5	BDL	2.5
Dibenzo(a,h)anthracene	BQL	22.5	BQL	22.5	BDL	2.5
Benzo(g,h,i)perylene	BQL	22.5	BQL	22.5	BDL	2.5

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bql = below quantitation limit.
bdl = below method detection limit

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Project mobile summary 2 Site Name TC-341

LAB ID.	0284	0285	0287
DATE SAMPLED	03/22/94	03/22/94	03/22/94
DATE EXTRACTED	03/23/94	03/23/94	03/23/94
FIELD ID.	TC341MW5	TC341MW6	TC341MW11

METHOD ANALYTE	ug/l	pql	ug/l	pql	ug/l	pql
610						
Naphthalene	BDL	0.5	BDL	0.5	BDL	0.5
Acenaphthylene	BDL	0.5	BDL	0.5	BDL	0.5
Acenaphthene	BDL	0.5	BDL	0.5	BDL	0.5
Fluorene	BDL	0.5	BDL	0.5	BDL	0.5
Phenanthrene	BDL	0.5	BDL	0.5	BDL	0.5
Anthracene	BDL	0.5	BDL	0.5	BDL	0.5
Fluoranthene	BDL	0.5	BDL	0.5	BDL	0.5
Pyrene	BDL	0.5	BDL	0.5	BDL	0.5
Benzo(a)anthracene	BDL	1.0	BDL	1.0	BDL	1.0
Chrysene	BDL	0.5	BDL	0.5	BDL	0.5
Benzofluoranthenes	BDL	2.0	BDL	2.0	BDL	2.0
Benzo(a)pyrene	BDL	2.0	BDL	2.0	BDL	2.0
Indeno(1,2,3-cd)pyrene	BDL	2.5	BDL	2.5	BDL	2.5
Dibenzo(a,h)anthracene	BDL	2.5	BDL	2.5	BDL	2.5
Benzo(g,h,i)perylene	BDL	2.5	BDL	2.5	BDL	2.5

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bql = below quantitation limit.
bdl = below method detection limit

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Project mobile summary 3 Site Name TC-341

LAB ID.	0288		0289	
DATE SAMPLED	03/22/94		03/22/94	
DATE EXTRACTED	03/23/94		03/23/94	
FIELD ID.	TC341MW12		Rinse blank	
METHOD				
ANALYTE	ug/l	pql	ug/l	pql
610				
Naphthalene	BDL	0.5	BDL	0.5
Acenaphthylene	BDL	0.5	BDL	0.5
Acenaphthene	BDL	0.5	BDL	0.5
Fluorene	BDL	0.5	BDL	0.5
Phenanthrene	BDL	0.5	BDL	0.5
Anthracene	BDL	0.5	BDL	0.5
Fluoranthene	BDL	0.5	0.7	0.5
Pyrene	BDL	0.5	0.9	0.5
Benzo(a)anthracene	BDL	1.0	1.4	1.0
Chrysene	BDL	0.5	1.0	0.5
Benzofluoranthenes	BDL	2.0	2.0	2.0
Benzo(a)pyrene	BDL	2.0	BQL	2.0
Indeno(1,2,3-cd)pyrene	BDL	2.5	BQL	2.5
Dibenzo(a,h)anthracene	BDL	2.5	BQL	2.5
Benzo(g,h,i)perylene	BDL	2.5	BQL	2.5

	soil	*water*
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bql = below quantitation limit.
bdl = below method detection limit

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Project mobile summary 4 Site Name TC-341

LAB ID.	0281	0286	0289
DATE SAMPLED	03/22/94	03/22/94	03/22/94
DATE ANALYZED	03/25/94	03/23/94	03/23/94
FIELD ID.	TC341MW1	TC341MW8	Rinse blank

METHOD

ANALYTE	ug/l	pql	ug/l	pql	ug/l	pql
EPA 602						
Benzene	BQL	1.3	BDL	0.5	BDL	0.5
Toluene	BQL		BDL		BDL	
Chlorobenzene	BQL		BDL		BDL	
Ethylbenzene	4.0		BDL		BDL	
Xylenes	1.8		BDL		BDL	
1,3 Dichlorobenzene	BQL		BDL		BDL	
1,4 Dichlorobenzene	BQL		BDL		BDL	
1,2 Dichlorobenzene	BQL		BDL		BDL	

	soil	water
parts per million =	*mg/kg*	*mg/l*
parts per billion =	*ug/kg*	*ug/l*

pql = practical quantitation limit due to matrix effects.
bdl = below method detection limit.
bql = below quantitation limit.

QUALITY CONTROL RESULTS

METHOD	RECOVERY	METHOD DETECTION LIMIT
610		
Naphthalene	92 %	0.5 ppb
Acenaphthene	95 %	
Phenanthrene	114 %	
602		
Benzene	94 %	0.5 ppb
Toluene	94 %	
Chlorobenzene	94 %	
Ethylbenzene	96 %	
Xylenes	95 %	
1,3-Dichlorobenzene	92 %	
1,2-Dichlorobenzene	89 %	
1,4-Dichlorobenzene	96 %	

REVIEWED BY

Laura Fogleman

REVIEWED BY

Valeri G. Ka

2500 Gate Way Centre Blvd., Suite 300 • Morrisville, NC 27560
Telephone: 919-460-8093 • FAX: 919-460-0167

Report To:
Brian Bellis
Law Eng / Raleigh

GeoChem, Incorporated

Environmental Laboratories

2500 Gate Way Centre Blvd., Suite 300
Morrisville, NC 27560

Bill To:

Chain of Custody Record

PROJECT SITE NUMBER: TC-341 (Camp Geiger) | PO#:
SITE NAME: 475-09183-01
COLLECTED BY (Signature): Dary A. Fiscus
GEOCHEM PROJECT #: 9403-020m
DATE DUE: ASAP
VERBAL/FAX/HARDCOPY

FIELD SAMPLE ID	TURNAROUND IN DAYS	SAMPLE MATRIX	DATE AND TIME COLLECTED	NO. OF CONTAINERS PER LOCATION	602	610	ANALYSES	REMARKS	LAB ID NO. (for lab use only)
TC341mw1	24 hr.	GH2O	3-22-94 / 1255	3	2	1			281
TC-341mw2	"	"	3-22-94 / 1330	1		1			282
TC-341mw3	"	"	3-22-94 / 1540	1		1			283
TC341mw5	"	"	3-22-94 / 1135	1		1			284
TC341mw6	"	"	3-22-94 / 1015	1		1			285
TC341mw8	"	"	3-22-94 / 1715	2	2				286
TC341mw11	"	"	3-22-94 / 1115	1		1			287
TC341mw12	"	"	3-22-94 / 1655	1		1			288
Rinse blank	"	"	3 22-94 / 0730	3	2	1			289

REMARKS

RELINQUISHED BY: | DATE | TIME

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME
Russell Upchurch	3/23/94	1000	Dary A. Fiscus	3/23/94	11:50						

This Chain of Custody is considered a written contract to perform the services requested in the analyses

Law Environmental, Inc.
Pensacola Branch
7215 Pine Forest Road
Pensacola, Florida 32526

DRAFT

March 21, 1994

Mr. Wayne Wilkinson - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604
Clt. #12024 Proj. #475-09183-01

Dear: Mr. Wilkinson:

Below are the results of analysis of 15 samples received for examination on March 11, 1994:

Sample I.D. AA51319 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-11 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/04/94 Time: 09:24
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.23

Sample I.D. AA51320 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-11 S-2 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/04/94 Time: 09:18
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	11	3.2
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.26

DRAFT

Sample I.D. AA51321 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-12 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 14:40
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	2.9
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.23

Sample I.D. AA51322 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-12 S-1 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 14:46
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51323 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-13 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 15:27
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	2.8

DRAFT

Sample I.D. AA51323 (continued)

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.22

Sample I.D. AA51324 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-13 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 15:31
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51325 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-14 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 08:15
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	2.8
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.23

Sample I.D. AA51326 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-14 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 08:20

DRAFT

Sample I.D. AA51326 (continued)

Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	800	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	4100	25

Sample I.D. AA51327 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 09:45
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51328 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 09:50
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	490	39
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	200	56

DRAFT

Sample I.D. AA51329 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-16 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 10:49
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51330 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-16 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 10:56
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	2.9
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51331 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-17 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 15:52
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	2.9

DRAFT

Sample I.D. AA51331 (continued)

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.23

Sample I.D. AA51332 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-17 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 15:58
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

Sample I.D. AA51333 Location code: 2TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: Duplicate Sample collector: W. WILKINSON
Lab submittal date: 03/11/94 Time: 13:58

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot. Pet. Hydro. Prep. Soil		Done	
Multicomponent analysis: 2321-TPHXS Cal-DHS			
Diesel	mg/Kg	Not detected	3.0
Multicomponent analysis: 2321-TPHVS Cal-DHS			
Gasoline	mg/Kg	Not detected	.24

DRAFT

Please advise should you have questions concerning these data.

Respectfully submitted,

M.G.T 21 MAR 1994

James M.G. Tucci, Laboratory Manager

[illegible] Y R. [illegible] W ENVIRONMENTAL, INC.
NATIONAL LABORATORIES
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUS[illegible]DY RECORD

9829

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY
STREET ADDRESS

PROJECT NAME TC-341
JOB NO. 475-09183-01
SAMPLERS (SIGNATURE) Wayne [illegible] Dickinson
SAMPLING DATE 3-4-94 - 3-8-94

DATE SAMPLED OFF BOTTLES CNT

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G. W/M	2 oz. G. W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L PL (HNO_3)	1 L PL (H_2SO_4)	1 L PL (NaOH+Ascorbic Acid)	1 L PL (Zn Acetate + NaOH)	1 L PL	4 oz PL W/M	250 ml PL	1 L TEFLON	LENL LAB NO.
9:24	X		MW	MW-11 S-2 3.5-5.0	3			X	X		3-4-94									AA51319
9:18	X		MW	MW-11 S-1 0.0-1.5	3			X	X		3-4-94									AA51320
2:40	X		MW	MW-12 S-1 0.0-1.5	3			X	X		3-7-94									AA51321
2:46	X		MW	MW-12 S-2 3.5-5.0	3			X	X		3-7-94									AA51322
3:27	X		MW	MW-13 S-1 0.0-1.5	3			X	X		3-7-94									AA51323
3:31	X		MW	MW-13 S-2 3.5-5.0	3			X	X		3-7-94									AA51324
8:15	X		MW	MW-14 S-1 0.0-1.5	3			X	X		3-8-94									AA51325
8:20	X		MW	MW-14 S-2 3.5-5.0	3			X	X		3-8-94									AA51326
9:45	X		MW	MW-15 S-1 0.0-1.5	3			X	X		3-8-94									AA51327
9:50	X		MW	MW-15 S-2 3.5-5.0	3			X	X		3-8-94									AA51328
10:49	X		MW	MW-16 S-1 0.0-1.5	3			X	X		3-8-94									AA51329

NOTED BY [illegible] 3/10/94

RELINQUISHED BY:	DATE / TIME	RECEIVED BY:	DATE / TIME	RELINQUISHED BY:	RECEIVED BY LABORATORY:	DATE / TIME
Wayne [illegible] Dickinson (SIGNATURE)	3-9-94 [illegible]	(SIGNATURE)		(SIGNATURE)	[illegible] (SIGNATURE)	3/10/94 945 AM

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REMARKS SAMPLES ARE SOIL MATRIX

***SOURCE CODES**

RECOVERY WELL - RW
RCRA MONITORING WELL - MW
SOIL / SEDIMENT - SO
SLUDGE - SL
NPDES DISCHARGE - ND
DRINKING WATER - DW
HAZARDOUS WASTE - HW
SURFACE WATER - SW
NON-AQUEOUS - NA

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NATIONAL LABORATORIES
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PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUSTODY RECORD

8608

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY
STREET ADDRESS:

PROJECT NAME TC-341
JOB NO. 475-09183-01
SAMPLERS (SIGNATURE) [signature]
SAMPLING DATE 3-8-94

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G. W/M	2 oz. G. W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L PL (HNO_3)	1 L PL (H_2SO_4)	1 L PL (NaOH+Ascorbic Acid)	1 L PL (Zn Acetate + NaOH)	1 L PL	4 oz. PL W/M	250 ml PL	1 L TEFLON	DATE SAMPLED OFF BOTTLES	LENL LAB NO
10:56	X		MW	MW-16 S-2 3.5-5.0	2			X	X											3-8-94	AA51330
3:52	X		MW	MW-17 S-1 0.0-1.5	2			X	X											3-8-94	AA51331
3:58	X		MW	MW-17 S-2 3.5-5.0	2			X	X											3-8-94	AA51332
—	X		MW	Duplicate	2			X	X											Not given	AA51333

RELINQUISHED BY:	DATE / TIME	RECEIVED BY	DATE / TIME	RELINQUISHED BY	RECEIVED BY LABORATORY:	DATE / TIME
[signature] (SIGNATURE)	3-9-94 4:00 PM	(SIGNATURE)		(SIGNATURE)	[signature] (SIGNATURE)	3/10/94 845 AM

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REMARKS SAMPLES ARE SOIL MATRIX

***SOURCE CODES**
- RECOVERY WELL - RW
- RCRA MONITORING WELL - MW
- SOIL / SEDIMENT - SO
- SLUDGE - SL
- NPDES DISCHARGE - ND
- DRINKING WATER - DW
- HAZARDOUS WASTE - HW
- SURFACE WATER - SW
- NON-AQUEOUS - NA

DRAFT

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: LENL

Attn: Sample Receiving

From: Raleigh Law ENG
(Branch/Company Name)

(Dept or Name)

COC Number: 9829 / 8608

Project Name: TC-341

Project Number: 475-0918-01

Date Shipped:

Date results requested: 5 day TAT

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
MW-11 S-2 3.5-5.0	TPH 3550/5030	STD	Soil	EPA 3550/5030
MW-11 S-1 0.0-1.5				
MW-12 S-1 0.0-1.5				
MW-12 S-2 3.5-5.0				
MW-13 S-1 0.0-1.5				
MW-13 S-2 3.5-5.0				
MW-14 S-1 0.0-1.5				
MW-14 S-2 3.5-5.0				
MW-15 S-1 0.0-1.5				
MW-15 S-2 3.5-5.0				
MW-16 S-1 0.0-1.5				
MW-16 S-2 3.5-5.0				
MW-17 S-1 0.0-1.5				
MW-17 S-2 3.5-5.0				

Comments:
- Duplicate

Law Environmental, Inc.
Pensacola Branch
7215 Pine Forest Road
Pensacola, Florida 32526

DRAFT

March 24, 1994

Mr. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604
Clt. #12024 Proj. #475-09183-01

Dear: Mr. Bellis:

Below are the results of analysis of 19 samples received for examination on March 11, 1994:

Sample I.D. AA51280 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-16 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 10:56
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	6.55	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51281 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-17 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 15:52
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	7.23	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	11	11.0

Sample I.D. AA51282 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-3 8.5-10.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 10:04
Lab submittal date: 03/11/94 Time: 10:50

DRAFT

Sample I.D. AA51282 (continued)

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	5.53	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51283 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-11 S-3 8.5-10.0
Sample collector: W. WILKINSON
Sample collection date: 03/04/94 Time: 09:32
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	12.0

Sample I.D. AA51284 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-13 S-3 8.5-10.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 15:34
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	12.0

Sample I.D. AA51285 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-4 13.5-15.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 10:09
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	13.0

Sample I.D. AA51286 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-16 S-3 8.5-10.0

DRAFT

Sample I.D. AA51286 (continued)

Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 11:00
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	13.0

Sample I.D. AA51287 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-12 S-3 8.5-10.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 14:50
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	12.0

Sample I.D. AA51288 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-14 S-3 8.5-10.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 08:56
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	350	12.0

Sample I.D. AA51289 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-7 28.5-30.0
Sample collector: W. WILKINSON
Sample collection date: 03/09/94 Time: 09:12
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	11.0

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Sample I.D. AA51290 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-11 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/04/94 Time: 09:24
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-TCLP Ext. Met. S. EPA 1311		Done	
Multicomponent analysis: 2310-TCLP Metals EPA 6010			
Arsenic	ug/L	Not detected	42
Barium	ug/L	400	30
Cadmium	ug/L	Not detected	4.0
Chromium	ug/L	Not detected	8.0
Lead	ug/L	Not detected	37
Selenium	ug/L	Not detected	79
Silver	ug/L	Not detected	8.0
Multicomponent analysis: 2310-TCLP Mercury EPA 7470			
Mercury	ug/L	Not detected	.20
2310-pH Soil EPA 9045	units	6.52	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51291 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-12 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 14:40
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2323-Ignitability EPA 1010	degrees F	No Flash	200
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	11.0

Sample I.D. AA51292 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-12 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 14:46
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	7.26	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

DRAFT

Sample I.D. AA51293 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-13 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 15:27
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	6.02	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51294 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-13 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/07/94 Time: 15:31
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	5.93	+/-

Sample I.D. AA51295 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-14 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 08:15
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	7.48	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51296 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-14 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 08:20
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-TCLP Ext. Met. S. EPA 1311		Done	

DRAFT

Sample I.D. AA51296 (continued)

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
Multicomponent analysis: 2310-TCLP Metals EPA 6010			
Arsenic	ug/L	Not detected	42
Barium	ug/L	260	30
Cadmium	ug/L	Not detected	4.0
Chromium	ug/L	Not detected	8.0
Lead	ug/L	Not detected	37
Selenium	ug/L	Not detected	79
Silver	ug/L	Not detected	8.0
Multicomponent analysis: 2310-TCLP Mercury EPA 7470			
Mercury	ug/L	Not detected	.20
2323-Ignitability EPA 1010	degrees F	No Flash	200
2323-Tot.Rec. O&G Grav. EPA 9071	mg/Kg	Not Det	12.0

Sample I.D. AA51297 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-15 S-2 3.5-5.0
Sample collector: W. WILKINSON
Sample collection date: 03/08/94 Time: 09:50
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	5.53	+/-
2323-Ignitability EPA 1010	degrees F	No Flash	200

Sample I.D. AA51298 Location code: TC341
Purchase order number: 47509183 Project account code: 12024
Location Description: MW-16 S-1 0.0-1.5
Sample collector: W. WILKINSON
Sample collection date: 03/04/94 Time: 10:49
Lab submittal date: 03/11/94 Time: 10:50

TEST PARAMETER	UNITS	TEST RESULT	DETECTION LIMIT
2310-pH Soil EPA 9045	units	5.56	+/-

DRAFT

Please advise should you have questions concerning these data.

Respectfully submitted,

23 MAR 1994

James M.G. Tucci, Laboratory Manager

.W ENVIRONMENTAL, INC.
NATIONAL LABORATORIES
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUS. ..DY RECORD

8615

SAMPLING INFORMATION — NAME OF FACILITY: _____ STREET ADDRESS: _____ NPDES NUMBER

PROJECT NAME: TC-341 JOB NO. 475-89183-01

SAMPLERS (SIGNATURE): Wayne Wahlen

SAMPLING DATE: 3-4-94 / 3-5/94

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G. W/M	2 oz. G. W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
10:56	Y		MW	3/9 3/8 MW-16 S-2 3.5-5.0	2		X				pH	1010								AA51280
3:52	Y		MW	3/8 MW-17 S-1 0.0-1.5	3		X				pH	1010	9071							AA51281
~~3:58~~	~~Y~~		~~MW~~	~~MW-17 S-2 3.5-5.0~~			X													
10:04	X		MW	3/8 MW-15 S-3 8.5-10.0	2		X				pH	1010								AA51282
9:32	X		MW	3/4 MW-11 S-3 8.5-10.0	1		X				9071									AA51283
3:34	X		MW	3/7 MW-13 S-3 8.5-10.0	1		X				9071									AA51284
10:09	X		MW	3/8 MW-15 S-4 13.5-15.0	1		X				9071									AA51285
11:08	Y		MW	3/8 MW-16 S-3 8.5-10.0	1		X				9071									AA51286
2:58	X		MW	3/7 MW-12 S-3 8.5-10.0	1		X				9071									AA51287
8:56	X		MW	3/8 MW-14 S-3 8.5-10.0	1		X				9071									AA51288
9:12	X		MW	3/9 MW-15 S-7 28.5-30.0	1		X				9071									AA51289

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY LABORATORY: (SIGNATURE)	DATE / TIME
Wayne Wahlen	3-9-94 6:00PM				Nida S. Jenkel	3/10/94 0845

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REMARKS _____

***SOURCE CODES**

RECOVERY WELL - RW	NPDES DISCHARGE - ND
RCRA MONITORING WELL - MW	DRINKING WATER - DW
SOIL / SEDIMENT - SO	HAZARDOUS WASTE - HW
SLUDGE - SL	SURFACE WATER - SW
	NON-AQUEOUS - NA

.W ENVIRONMENTAL, INC.
NATIONAL LABORATORIES
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUS. .DY RECORD

8620

SAMPLING INFORMATION
NPDES NUMBER
NAME OF FACILITY
STREET ADDRESS

PROJECT NAME: TC-341
JOB NO. 475-09183-01
SAMPLERS (SIGNATURE): Wayne Wiekman
SAMPLING DATE: 3-4-94 - 3-9-94

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G, W/M	2 oz. G, W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1 L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
9:24	X		MW	3/4 MW-11-S-2 3.5-5.0	2		X				metals		pH		1010					AA51290
9:18	X		MW	MW-11 S-1 0.0-1.5			X													
2:40	X		MW	3/7 MW-12 S-1 0.0-1.5	2		X				1010	9071								AA51291
2:46	X		MW	3/7 MW-12 S-2 3.5-5.0	2		X				pH	1010								AA51292
3:27	X		MW	3/7 MW-13 S-1 0.0-1.5	2		X				pH	1010								AA51293
3:31	X		MW	3/7 MW-13 S-2 3.5-5.0	1		X				pH									AA51294
8:15	X		MW	3/8 MW-14 S-1 0.0-1.5	2		X				pH	1010								AA51295
8:20	X		MW	3/8 MW-14 S-2 3.5-5.0	3		X				metals	1010	9071							AA51296
9:45	X		MW	MW-15 S-1 0.0-1.5			X													
9:50	X		MW	3/8 MW-15 S-2 3.5-5.0	2		X				pH	1010								AA51297
10:45	X		MW	3/4 MW-16 S-1 0.0-1.5	1		X				pH									AA51298

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	DATE / TIME	RELINQUISHED BY (SIGNATURE)	RECEIVED BY LABORATORY (SIGNATURE)	DATE / TIME
Wayne Wiekman	3-9-94 0:01				Nida S. Winkel	3/10/94 08:45

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

REMARKS

***SOURCE CODES**

- RECOVERY WELL - RW
- RCRA MONITORING WELL - MW
- SOIL / SEDIMENT - SO
- SLUDGE - SL
- NPDES DISCHARGE - ND
- DRINKING WATER - DW
- HAZARDOUS WASTE - HW
- SURFACE WATER - SW
- NON-AQUEOUS - NA

DRAFT

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: LENL　　　　Attn: Sample Receiving

From: Raleigh Law Eng
(Branch/Company Name)　　　　(Dept or Name)

COC Number: ~~[illegible]/[illegible]~~ 8615/8620

Project Name: TC-341　　　　Project Number: 475-09183-01

Date Shipped: 3-9-94　　　　Date results requested: 5 day TAR

TCLP Per Mr Wilkinson Per Ms Upton 03/11/94 1015

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
MW-11 S-2 3.5-5.0	METALS, pH	Std	Soil	EPA
MW-14 S-2 3.5-5.0	METALS	Std	Soil	
MW-12 S-2 3.5-5.0	pH	Std	Soil	
MW-13 S-2 3.5-5.0	pH	"	"	
MW-14 S-1 0.0-1.5	pH	"	"	
MW-15 S-2 3.5-5.0	pH	"	"	
MW-16 S-1 0.0-1.5	pH	"	"	
MW-17 S-1 0.0-1.5	pH	"	"	
MW-16 S-2 3.5-5.0	pH	"	"	
MW-13 S-1 0.0-1.5	pH	"	"	
MW-15 S-3 8.5-10.0	pH	"	"	
MW-15 S-3 8.5-10.0	FLASH PT	"	"	
MW-15 S-2 3.5-5.0	" "	"	"	
MW-16 S-2 3.5-5.0	" "	"	"	

Comments:

DRAFT

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: LENL

Attn: Sample Receiving

From: Raleigh / LAW ENG
(Branch/Company Name)

(Dept or Name)

COC Number: 8615 / 8620

Project Name: TC-341

Project Number: 475-09183-01

Date Shipped: 3-5-94

Date results requested: 5 day TAT

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
MW-17 S-1 0.0-1.5	FLASH Point	Std	Soil	EPA
MW-14 S-1 0.0-1.5	"	"	"	
MW-14 S-2 3.5-5.0	"	"	"	
MW-13 S-1 0.0-1.5	"	"	"	
MW-12 S-1 0.0-1.5	"	"	"	
MW-11 S-2 3.5-5.0	"	"	"	
MW-12 S-2 3.5-5.0	"	"	"	
MW-11 S-3 8.5-10.0	TPH 9071	"	"	
MW-12 S-1 0.0-1.5	" "	"	"	
MW-13 S-3 8.5-10.0	" "	"	"	
MW-14 S-2 3.5-5.0	" "	"	"	
MW-15 S-4 13.5-15.0	" "	"	"	
MW-16 S-3 8.5-10.0	" "	"	"	
MW-17 S-1 0.0-1.5	" "	"	"	

Comments:

DRAFT

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: LENC

Attn: Sample Receiving

From: Raleigh/Law Env
(Branch/Company Name)

(Dept or Name)

COC Number: 8615/8620

Project Name: TC-34

Project Number: 475-09183-01

Date Shipped: 3-5-94

Date results requested: 5 day TAT

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
MW-12 5-3 8.5-10.0	TPH 9071	Std	Soil	EPA
MW-14 5-3 8.5-10.0	" "	"	"	↓
MW-15 5-7 28.5-30.0	" "	"	"	↓

Comments:

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

DRAFT

March 30, 1994

Mr. Brian Bellis
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Subject: Chemical Analysis of Samples Received on 03/24/94
Project Number: 475-09183-01

Dear Mr. Bellis:

Law Environmental National Laboratories has completed its analysis of your samples and reports the results on the following pages. These results relate only to the contents of the samples as submitted. This report shall not be reproduced except in full without the approval of Law Environmental National Laboratories.

If further assistance is needed, please feel free to contact Kelli Silvia or myself at (904) 944-9772.

Sincerely,

LAW ENVIRONMENTAL NATIONAL LABORATORIES

M.G.T

James M.G. Tucci
Laboratory Manager

JMGT/kas

Enclosures: Data Report
Invoice

LAW ENGINEERING, INC.
7215 PINE FOREST ROAD
PENSACOLA, FL 32526

904-944-9772
FAX 904-944-9463

ONE OF THE LAW COMPANIES

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

'30/94

--- Project Information ---

..ır. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW1
Lab ID: AA51782
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 12:55
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2310-ICP Met Dig. W. EPA 3010		EPA 3010		Done	03/28/94	JG
2310-ICP Metals W. EPA 6010	ug/L	EPA 6010		_TITLE_	03/28/94	CH
Arsenic	ug/L	EPA 6010	42	44	03/28/94	CH
Barium	ug/L	EPA 6010	30	390	03/28/94	CH
Cadmium	ug/L	EPA 6010	4.0	Not detected	03/28/94	CH
Chromium	ug/L	EPA 6010	8.0	Not detected	03/28/94	CH
Lead	ug/L	EPA 6010	37	Not detected	03/28/94	CH
Selenium	ug/L	EPA 6010	79	Not detected	03/28/94	CH
lver	ug/L	EPA 6010	8.0	Not detected	03/28/94	CH
.0-Mercury Water EPA 7470	ug/L	EPA 7470	0.2	Not Det	03/28/94	RAF

Remarks:

Digestion for this sample was performed by method 3030C.

Signed: M.G.T. 30 MAR 1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

TEST DATA REPORT

DRAFT

--/30/94

--- Project Information ---

.. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW4
Lab ID: AA51783
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 16:40
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2310-ICP Met Dig. W. EPA 3010		EPA 3010		Done	03/28/94	JG
2310-ICP Metals W. EPA 6010	ug/L	EPA 6010		_TITLE_	03/28/94	CH
Arsenic	ug/L	EPA 6010	42	Not detected	03/28/94	CH
Barium	ug/L	EPA 6010	30	590	03/28/94	CH
Cadmium	ug/L	EPA 6010	4.0	11	03/28/94	CH
Chromium	ug/L	EPA 6010	8.0	31	03/28/94	CH
Lead	ug/L	EPA 6010	37	60	03/28/94	CH
Selenium	ug/L	EPA 6010	79	Not detected	03/28/94	CH
Silver	ug/L	EPA 6010	8.0	Not detected	03/28/94	CH
0-Mercury Water EPA 7470	ug/L	EPA 7470	0.2	Not Det	03/28/94	RAF

Remarks:

Digestion for this sample was performed by method 3030C.

Signed: 30MAR1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

`/30/94

--- Project Information ---

.ir. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW9
Lab ID: AA51784
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 10:50
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.2	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.2	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.2	Not detected	03/29/94	MG
nzo[ghi]perylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
.nzo[a]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.2	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.89	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.89	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG

Remarks:

Signed: 30MAR1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

03/30/94

--- Project Information ---

Page 1

r. Brian Bellis - 475

Law Engineering, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 3TC341

Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW13

Lab ID: AA51785

Collector: GARY FISCHER

Date Sampled: 03/22/94

Time Sampled: 09:40

Log In Date: 03/24/94

Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.83	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.83	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: 30MAR1994

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

'30/94

--- Project Information ---

.ır. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW14
Lab ID: AA51786
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 08:25
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/30/94	MG
Acenaphthene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Acenaphthylene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Anthracene	ug/L	EPA 610	21	520	03/30/94	MG
Benzo[a]anthracene	ug/L	EPA 610	42	Not detected	03/30/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	42	Not detected	03/30/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	42	Not detected	03/30/94	MG
ızo[ghi]perylene	ug/L	EPA 610	21	Not detected	03/30/94	MG
.zo[a]pyrene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Chrysene	ug/L	EPA 610	42	Not detected	03/30/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Fluoranthene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Fluorene	ug/L	EPA 610	21	Not detected	03/30/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	21	Not detected	03/30/94	MG
1-Methylnaphthalene	ug/L	EPA 610	17	990	03/30/94	MG
2-Methylnaphthalene	ug/L	EPA 610	17	2500	03/30/94	MG
Naphthalene	ug/L	EPA 610	21	620	03/30/94	MG
Phenanthrene	ug/L	EPA 610	21	610	03/30/94	MG
Pyrene	ug/L	EPA 610	21	Not detected	03/30/94	MG

Remarks:

Signed: J M.G.T 30 MAR 1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

'30/94

--- Project Information ---

.r. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW15
Lab ID: AA51787
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 08:45
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
nzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
.zo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.83	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.83	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: 30 MAR 1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

3/30/94

--- Project Information ---

Mr. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW16
Lab ID: AA51788
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 07:50
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: 30MAR1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

3/30/94

--- Project Information ---

Mr. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW17
Lab ID: AA51789
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 09:15
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (PID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
enzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
enzo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: 30 MAR 1994

James M.G. Tucci
Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

'30/94

--- Project Information ---

.r. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Page 1
Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW8
Lab ID: AA51790
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 17:15
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	3.1	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
nzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
zo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.82	1.4	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.82	4.3	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	5.8	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: M.G.T 30 MAR 1994

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TEST DATA REPORT

30/94

--- Project Information ---

Page 1

r. Brian Bellis - 475

Law Engineering, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 3TC341

Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: Trip Blank

Lab ID: AA51791

Collector: GARY FISCHER

Date Sampled: 03/22/94

Time Sampled:

Log In Date: 03/24/94

Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Benzo[ghi]perylene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Benzo[a]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.0	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	0.8	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.0	Not detected	03/29/94	MG

Remarks:

Signed: 30 MAR 1994

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

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TEST DATA REPORT

'30/94

--- Project Information ---

.r. Brian Bellis - 475

Law Engineering, Inc.

3301 Atlantic Avenue

Raleigh, NC 27604

Project Name: 3TC341

Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW7

Lab ID: AA51792

Collector: GARY FISCHER

Date Sampled: 03/22/94

Time Sampled: 10:00

Log In Date: 03/24/94

Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
ızo[ghi]perylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
.zo[a]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.85	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.85	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG

Remarks:

Signed: 30 MAR 1994

James M.G. Tucci

Laboratory Manager

LAW ENVIRONMENTAL NATIONAL LABORATORIES

DRAFT

TEST DATA REPORT

3/30/94

--- Project Information ---

Mr. Brian Bellis - 475
Law Engineering, Inc.
3301 Atlantic Avenue
Raleigh, NC 27604

Project Name: 3TC341
Clt. #12024 Proj. #475-09183-01

--- Sample Information ---

Station ID: TC341MW7
Lab ID: AA51792
Collector: GARY FISCHER

Date Sampled: 03/22/94
Time Sampled: 10:00
Log In Date: 03/24/94
Log In Time: 14:41

--- Test Information ---

Parameter	Units	Method	Det Lim	Result	Analysis Date	Tech
2323-LiqLiq Ext. EPA 3520 (FID)		EPA 3520		Done	03/26/94	MWF
2321-PAH W. EPA 610	ug/L	EPA 610		_TITLE_	03/29/94	MG
Acenaphthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Acenaphthylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Benzo[a]anthracene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[b]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Benzo[k]fluoranthene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
nzo[ghi]perylene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
nzo[a]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Chrysene	ug/L	EPA 610	2.1	Not detected	03/29/94	MG
Dibenzo[a,h]anthracene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluoranthene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Fluorene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Indeno[1,2,3-cd]pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
1-Methylnaphthalene	ug/L	EPA 610	.85	Not detected	03/29/94	MG
2-Methylnaphthalene	ug/L	EPA 610	.85	Not detected	03/29/94	MG
Naphthalene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Phenanthrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG
Pyrene	ug/L	EPA 610	1.1	Not detected	03/29/94	MG

Remarks:

Signed: 30 MAR 1994

James M.G. Tucci
Laboratory Manager

W ENVIRONMENTAL, INC.
NATIONAL LABORATORIES
7215 PINE FOREST ROAD
PENSACOLA, FLORIDA 32526
(904) 944-9772

CHAIN OF CUS DY RECORD

9992

SAMPLING INFORMATION
NPDES NUMBER

NAME OF FACILITY: _____

STREET ADDRESS: _____

PROJECT NAME: TC 341 (Camp Geiger) | JOB NO.: 475-09183 c1

SAMPLERS (SIGNATURE): Gary A. Finch

SAMPLING DATE: 3/22/94

TIME	GRAB	COMP.	*SOURCE CODE	SAMPLE STATION DESCRIPTION	TOTAL NO. OF CONTAINERS	40 ml G VOA HCl	1 L G - AMBER	8 oz. G. W/M	2 oz. G. W/M	1 L G (H_2SO_4)	500 ml - AMBER	1 L. PL (HNO_3)	1 L. PL (H_2SO_4)	1L. PL (NaOH+Ascorbic Acid)	1 L. PL (Zn Acetate + NaOH)	1 L. PL	4 oz. PL W/M	250 ml PL	1 L. TEFLON	LENL LAB NO.
1255	X		mw	TC341mw1	1						1									AA51782
1640	X		mw	TC341mw4	1						1									AA51783
1050	X		mw	TC341mw9	2		2													AA51784
0940	X		mw	TC341mw13	2		2													AA51785
0825	X		mw	TC341mw14	2		2													AA51786
0845	X		mw	TC341mw15	2		2													AA51787
0750	X		mw	TC341mw16	2		2													AA51788
0915	X		mw	TC341mw17	2		2													AA51789
1715	X		mw	TC341mw8	2		2													AA51790
				Trip Blank	2		2													AA51791
1000	X		mw	TC341mw7 dup	2		2													AA51792

RELINQUISHED BY: (SIGNATURE)	DATE / TIME	RECEIVED BY: (SIGNATURE)	DATE / TIME	RELINQUISHED BY: (SIGNATURE)	RECEIVED BY LABORATORY: (SIGNATURE)	DATE / TIME
Gary A. Finch	3/23/94 0930					3/24/94 9:00

DISTRIBUTION: ORIGINAL AND YELLOW COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY. PINK COPY RETAINED BY SAMPLERS. YELLOW COPY RETAINED BY LABORATORY.

REMARKS Shipped via Fed Ex. Air Bill # 836565233

***SOURCE CODES**

RECOVERY WELL - RW	NPDES DISCHARGE - ND
RCRA MONITORING WELL - MW	DRINKING WATER - DW
SOIL / SEDIMENT - SO	HAZARDOUS WASTE - HW
SLUDGE - SL	SURFACE WATER - SW
	NON-AQUEOUS - NA

DRAFT

Law Environmental, Inc.
7215 Pine Forest Road
Pensacola, Florida 32526
904/944-9772

Analytical Request Form

To: LENC Attn: Sample Receiving

From: Law / Raleigh (Branch/Company Name) Brian Bellis / 475 (Dept or Name)

COC Number: 9992

Project Name: TC-341 (Camp Geiger) Project Number: 475-09183-01

Date Shipped: 3-23-94 Date results requested: 5 day turn.

Sample ID	Analysis Requested	Detection Limits Req.	Sample Type	Method
TC341 MW1	8 RCRA metals w/ 3030C Prep.	Std.	H_2O	
TC341 MW4	8 RCRA metals w/ 3030C Prep.	"	"	
TC341 MW8	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW9	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW13	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW14	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW15	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW16	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW17	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
Trip Blank	Polynuclear Aromatic Hydrocarbons	"	"	EPA 610
TC341 MW7	" " "	"	"	EPA 610

Comments:

DRAFT

SAMPLE RECEIPT DISCREPANCY REPORT

Sample Control Technician: JASON McDANIEL Date: 03/24/94

Project Name: TC-341 Camp Geiger Project Number: 425-0983-01

Sample ID	Lab ID	Discrepancy
~~AA51786~~		
TC341 MW14	AA51786	- sample bottles 1072 arrived broken in shipment!
TC341 MW17	AA51789	- sample bottles 1072 arrived broken in shipment!
TC341 MW7	AA51792	- was not on COC, added to C.O.C

Follow-Up

Contacted: _____ Contacted By: _____

There was enough remaining volume to run analysis Requested. TC341 MW7 was added to COC & analytical request at lab.